KENTUCKY DESIGN MANUAL

Kentucky Green & Healthy Schools

DESIGN CRITERIA

Kentucky Environmental Education Council

Special thanks to the Department for Energy Development and Independence and the New Jersey Green Schools Program

A special thank you to the Kentucky Green & Healthy Schools Task Force and Subcommittees

Bluegrass PRIDE
Amy Sohner ●
Maxine Rudder ●

Cabinet for Health and Family Services
Guy Delius ●

Campbellsville University
Teresa Spurling

CMTA Engineers
David Higgins ✱
Ken Seibert

Department of Education
John Drake ▲
John Noel ✱
Jackie Hensley ✱
Mark Ryles
Monica Simpson ●
Paul McElwain ●
Robin Chandler ●
Tim Lucas

Division of Technology Services
Gary Buchholz

Eastern Kentucky Pride
Jennifer Johnson ●
Karen Deaton ✱

Environmental and Public Protection Cabinet
Cheryl Taylor
Elizabeth Robb ●
Erik Siegel ●
Kate Shanks ●

Department for Energy Development and Independence
Gregory Guess ✱
James Bush
John Davies ▲

Hardin County Schools
Laura Lang

Jefferson County Public Schools
David Wicks ●
Debra Davies

Kenton County Public Schools
Robert Lape ▲

Kentucky Environmental Education Council
Jane Eller ✱ ●
John LeFevre ✱
Maria Zoretic

Kentucky Science Teachers Association
Teri Lampkins ●

Kentucky Transportation Cabinet
Brent Sweger ▲
Jesse Mayes ●
Paula Nye ●
Shelby Jett ✱

Louisville Green Cities Program
Gordon Garner ▲

Northern Kentucky University
Yvonne Meichtry ▲

Pulaski County Public Schools
Frances Carter ▲

Ross -Tarrant Architects
Martha Tarrant ✱

The Kentucky NEED Project
Karen Reagor ●
Pam Proctor ✱

University of Louisville
Russell Barnett ▲
Stephen Roosa ✱

Chuck Effinger (CEM, CIAQP, LEED AP) ✱

Subcommittee Legend

● Existing Schools Subcommittee

✱ New Schools Subcommittee

▲ Green Schools Policy and Funding Subcommittee

TABLE OF CONTENTS

INTRODUCTION

BACKGROUND


Courtesy of Ross Tarrant Architects, Inc.

The Kentucky Green & Healthy Schools (KGHS) Program is a new, voluntary effort to provide districts, students, and staff with the tools needed to make their schools healthier and operate at top efficiency. Although KGHS incorporates a two-pronged approach, existing schools and new or renovating schools, only the latter will be discussed in this manual. Information about the existing schools component is available at http://www.greenschools.ky.gov.

This second component recognizes Kentucky schools and their design teams for constructing greener and healthier learning environments. Schools achieving this goal are recognized as a New Kentucky Green & Healthy School.

There are two ways to earn this recognition. Option one is through the U.S. Green Buildings Council's Leadership in Energy and Environmental Design (LEED) program. A building that is LEED certified automatically qualifies as a New Kentucky Green & Healthy School. Option two is to use the Kentucky Green & Healthy Schools Design Manual. School must meet all prequistes and achieve at least a minimum score of 90 (out of 133) on the design criteria checklists. Any school scoring at or above this minimum is awarded the New Kentucky Green & Healthy School flag. Instructions and the checklists are located in the Appendix.

AUDIENCE

The Kentucky Green and Healthy Schools Design Manual is beneficial for school administrators, architects, engineers and others involved in building or renovating schools. Although this Design Manual is a valuable resource, it should build upon existing guidelines used by architects and other design professionals. In other words, this manual should support and inform the design process, not determine it.

ORGANIZATION AND CONTENT

The purpose of the Kentucky Green & Healthy Schools Design Manual is to help districts build or renovate schools that are healthier and operate at top efficiencies. This design manual accomplishes this by outlining 20 design criteria. For each criteria there is a fact sheet that contains the following five sections:

- **The What and Why...**
  A brief explanation of the design criteria
- **Impact on Other Systems**
  Discusses how the criteria interacts with other green and healthy school criteria and systems

- **Recommendations**
  A brief list of best practice recommendations for incorporating the criteria into a green and healthy school
- **Reference Standards and Guidelines**
  A list of reference and standards and/or guidelines applicable to the design criteria
- **Industry and Governmental Resources**
  Additional references and resources that expand on the information in the fact sheet
- **Criteria Checklist**
  Use to identify those elements of a Green and Health School that have been incorporated into your design

Within this manual the design criteria are categorized into one of four sections. These sections and the 20 design criteria are listed below.

Energy

Building Shell
HVAC (heating, ventilation and air-conditioning)
Daylighting
Electric Lighting
Energy Analysis
Commissioning

Health & Comfort

Visual Comfort
Thermal Comfort
Acoustic Comfort
Indoor Air Quality

Environment

Environmentally Responsive Site Planning
Water Efficiency
Environmentally Preferable Materials, Products and Practices
Renewable Energy

Safe & Accessible

Flexibility and Adaptability
Safety and Security
Accessibility
Learning Centered Design
Information Technology
Outdoor Learning Areas

BUILDING SHELL

Courtesy of Ross Tarrant Architects, Inc.

THE WHAT AND WHY…

The building shell (walls, roofs, floors, and windows) of a Green and Healthy school should enhance energy efficiency without compromising durability, maintainability, or acoustic, thermal or visual comfort. An energy-efficient building shell is one that integrates and optimizes insulation levels, glazing, shading, thermal mass, air leakage control, and light-colored exterior surfaces.

Investing in an energy-efficient building shell will reduce a school's operating expenses year after year while easing the strain on the environment. Many of the techniques employed – high performance glazing, shading devices, light-colored surfaces – are easily accessible to students and can be used as instructional aids.

IMPACT ON OTHER SYSTEMS

The building shell strongly impacts the performance of a school's HVAC and lighting systems. The amount of heat the building shell lets in or out determines how much heating or cooling the HVAC system must provide. The more efficient the building shell, the less the HVAC system will have to work and the smaller (and less expensive) it can be. Likewise, if the window system is designed to maximize natural daylight, less electric light will be needed. This will reduce the school's electricity costs. In addition, the school's need for cooling will decrease. This is because electric lights generate heat. In schools where less electric light is used, less waste heat will be created, resulting in a reduced demand for cooling and even more HVAC system savings.

RECOMMENDATIONS

The key to optimizing the building shell is an integrated approach to design. It considers how all the components of the shell interact with one another and with the building's lighting and heating/ventilating/air conditioning (HVAC) systems. Tools to analyze these interactions are readily available and can be used to create the optimal building shell based on total system performance.

As part of an integrated approach, the following actions, specific to the building shell, should be considered:

- Specify glazing that represents the best combination of insulating value, daylight transmittance and solar heat gain coefficient for its specific application and local climatic conditions.
- Consider exterior shading devices to reduce solar heat gain and minimize glare.
- Use the building's thermal mass to store heat and temper heat transfer.
- Consider adding thermal mass to increase the storage capacity and energy efficiency of the school.

- Consider air retarder systems (also referred to as 'air infiltration barriers') as a means of improving energy performance and reducing potential water damage and mold in walls and roofs.
- Consider using light-colored materials for walls and roofs in order to reflect, rather than absorb, solar energy.

REFERENCE STANDARDS AND GUIDELINES

ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings. American Society of Heating, Refrigerating and Air Conditioning Engineers: Atlanta, GA.
(www.ashrae.org)

International Energy Conservation Code. International Code Council.
http://www.iccsafe.org

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Bachman, L. Integrated Buildings: The Systems Basis of Architecture. Washington, DC: John Wiley & Sons, 2002.

Online Resources

- Energy Star Reflective Roof products, U.S. Environmental Protection Agency. www.energystar.gov/index.cfm?c=roof_prods.pr_roof_products

- Efficient Windows Collaborative. www.efficientwindows.org

- National Fenestration Rating Council. www.nfrc.org

- EPA Energy Star Program. www.energystar.gov.

- Federal Energy Management Program. www.eere.energy.gov/femp.

- U.S. Department of Energy. Energy Design Guidelines for High Performance Schools.
  http://www.eere.energy.gov/.

- Sustainable Buildings Industry Council.
  http://www.sbicouncil.org/. Online Video Training Available.

- Whole Building Design Guide. www.wbdg.org. Product Information by CSI Format Available.

BUILDING SHELL (BS) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ BS.1 (Prerequisite) Does the building shell exceed the requirements of the latest edition of the IECC by 10% or more in effective thermal performance? What is the composite U-value (including boundary layers) of a typical:

Roof Assembly __________

Wall Assembly __________

Window Assembly _______

☐ ☐ ☐ BS.1.1 (8 pts.) For each 5 per cent increment beyond the level in BS.1, credit 1 additional point up to a maximum of 8 points. Provide COMcheck or other computer models summary showing percentage improvements.

____

☐ ☐ ☐ BS.2 (1 pt.) Does the building design group the functions that may need less glazing (auditoriums, kitchens, etc?) on the east and west, and those that will benefit most from daylight (classrooms, corridors, etc.) on the north and south? Describe.

____

____

____

☐ ☐ ☐ BS.3 (1 pt.) Were light-colored surfaces used as a means of reducing heat gain? Describe.

____

____

____

☐ ☐ ☐ BS.4 (1 pt.) Are landscaping and/or exterior shading devices being used to reduce heat gain on the building envelope? Describe.

____

____

☐ ☐ ☐ BS.5 (1 pt.) Does the design for the building envelope performance include features to prevent: thermal bridging, moisture transfer, air infiltration, water intrusion, etc.? Describe each briefly.

____

____

☐ ☐ ☐ BS.6 (1 pt.) Was perimeter foundation insulation installed?

____

HVAC


Courtesy of Ross Tarrant Architects, Inc.

THE WHAT AND WHY…

A school's HVAC system provides the heating, ventilating, and air conditioning necessary for the comfort and well being of students, teachers, administrators and visitors. HVAC systems operating at peak efficiency;

- Use high-efficiency equipment.
- Are sized to meet demands of the facility.
- Include HVAC controls systems that boost system performance.
- Insulate ducts in unconditioned spaces and seal ductwork to prevent air leakage.

The HVAC system is one of the largest energy consumers in a school. Even modest improvements in system efficiency can yield relatively large savings in a school's operating budget. With the highly efficient systems available today (and the sophisticated analysis tools that can be used to select and size them), every school HVAC system can be designed to the highest levels of performance.

Various parts of the HVAC system (especially controls placed inside the classroom) can be used as instructional aids.

IMPACT ON OTHER SYSTEMS

In a Green and Healthy school, the HVAC system offers a range of cost saving opportunities. If accurate energy use estimates have been calculated, the HVAC system can be properly sized to meet these estimates. Daylighting, for example, will not only reduce the need for electric lights, it will also reduce the heat these lights create. This reduction may be sufficient to allow for a smaller, less expensive air conditioning unit to be specified.

RECOMMENDATIONS

The key to optimizing HVAC system performance is an integrated approach to design that considers the building as an interactive whole, rather than as an assembly of individual systems. For example, the benefits of an energy efficient building shell may be wasted if the HVAC equipment is not sized to take advantage of it. An integrated approach, one based on an accurate estimate of the impact of the high efficiency building shell, will allow the HVAC system to be sized for optimum performance. The resulting system will cost less to purchase, will use less energy, and will run more efficiently over time. As part of an integrated approach, the following actions (specific to HVAC systems) should be considered.

HVAC

USE HIGH EFFICIENCY EQUIPMENT:

- Specify non-CFC (chlorofluorocarbon) refrigerants for systems using large chillers.
- Use ENERGY STAR®-approved products.
- Consider heat recovery systems that pre-heat or pre-cool incoming ventilation air.
- Consider the capability for 'economizer cycles' for HVAC systems.
- Investigate the potential for on-site cogeneration.

PROPERLY SIZE THIS SYSTEM:

- Consider use of variable speed drives.
- Consider standard HVAC sizing safety factors as upper limits.
- Select systems that operate well under part-load conditions.

INCORPORATE CONTROLS THAT WILL BOOST SYSTEM PERFORMANCE

- Consider integrated building management systems that control HVAC, lighting, outside air ventilation, water heating, and building security.
- Consider individual HVAC controls for each classroom.
- Utilize HVAC building controls that reduce or turn off equipment when this building is not occupied.

REFERENCE STANDARDS AND GUIDELINES

Energy Star Approved Products.
(http://www.energystar.gov/index.cfm?fuseaction=find_a_product.).

The ASHRAE Advanced Energy Design Guide (AEDG)
http://www.ashrae.org/technology/page/938

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- American Society of Heating, Refrigerating and Air Conditioning Engineers. Cooling and Heating Load Calculation Manual. Atlanta, GA: ASHRAE 2003. (www.ashrae.org)

Online Resources

- Federal Energy Management Program (www.eere.energy.gov/femp). Online Energy Cost Calculator).
- U.S. Environmental Protection Agency. Energy Star Program. www.energystar.gov . Online Training Available.
- U.S. Department of Energy. www.eere.energy.gov.

Yes No N/A

☐ ☐ ☐ HVAC.1 (Prerequisite) Does the equipment specified exceed the requirements of the Kentucky Building Code by at least 10 percent? Submit COMcheck summary page.

☐ ☐ ☐ HVAC.2 (1 pt.) Has the HVAC system been selected to meet the maximum energy usage requirements of the 'Energy Analysis' section? Describe the type of HVAC system that has been selected.

☐ ☐ ☐ HVAC.3 (1 pt.) Was the HVAC system selected from a life cycle cost basis considering HVAC system first cost, annual energy cost, annual maintenance cost and future equipment replacement cost? If so, please describe briefly the analysis:

☐ ☐ ☐ HVAC.4 (1 pt.) Has the HVAC equipment been 'properly sized' to meet predicted demand? What tool was used to size the equipment?

☐ ☐ ☐ HVAC.5 (1 pt.) Is the HVAC control system capable of being controlled from one central location? Describe the system and also discuss its capabilities with regards to web access, system performance verification, individual classroom control and interaction with other non-HVAC systems.

☐ ☐ ☐ HVAC.6 (1 pt.) Is the entire system configured to minimize operation, maintenance and repair loss? If so, describe briefly.

☐ ☐ ☐ HVAC.7 (1 pt.) Is heat recovery provided for the ventilation system? If so, please describe briefly.

DAYLIGHTING


Courtesy of Tim Thornberry

THE WHAT AND WHY...

Daylighting is the controlled admission of natural light into a space through windows, skylights, or roof monitors. A Green and Healthy school should use as much natural daylight as possible (especially in classrooms) while avoiding excessive heat loss, heat gain, and glare.

Access to natural light is one of the most important attributes of a Green and Healthy school. Daylight is the highest quality light source for visual tasks, as it enhances the color and appearance of objects. Studies clearly indicate that daylighting can enhance student performance (see resources). Views from windows also provide a connection with the natural world and promote healthy vision by allowing frequent changes in focal distance.

Daylighting can also save school money. Properly designed systems can substantially reduce the need for electric lighting, which can account for 35 to 50 percent of a school's electrical energy consumption. An added benefit: waste heat from the lighting system is also reduced, which in turn reduces demand on the school's cooling equipment. These savings can be as much as 10 to 20 percent of a school's cooling energy usage. It's also worth noting that daylight provides these savings during the day, when demand for electric power is at its peak and rates are at their highest.

IMPACT ON OTHER SYSTEMS

Daylighting strategies, beginning with site orientation, interact strongly with a school's lighting and HVAC systems. Properly designed daylighting systems will reduce the need for electric light, thus lowering overall electricity usage. Less electric light also means less waste heat from the lighting system, reducing the need for cooling. Both of these strategies improve the school's bottom line by substantially reducing overall energy costs. Operable windows and skylights can also be opened to provide natural ventilation when outdoor conditions permit.

RECOMMENDATIONS

- Use a daylighting analysis tool (virtual or computer model) to help guide the design process.
- Design windows to allow daylight to penetrate as far as possible into a room. Consider using light shelves (solid horizontal elements placed above eye level, but below the top of the window) to reflect daylight deep into a room.
- Design for diffuse, uniform daylight deep into a room.

- Consider skylights (horizontal glazing), light from two sides, and/or clerestory windows.
- Consider building orientation to optimize daylighting potential.
- Avoid direct-beam sunlight.
- Avoid glare.
- Consider interior (shades, louvers, or blinds) and exterior (overhangs, trees) strategies to control glare and filter daylight.
- Design room layouts that take advantage of daylight. Consider sloped ceilings and/or light colored ceiling surfaces to help reflect daylight within the room.
- Integrate daylighting with the electric lighting system. Provide controls that turn off lights when sufficient daylight exists. Consider dimming controls that continuously adjust lighting levels in response to daylight conditions.
- Consider multiple switching capabilities if dimming controls are cost prohibitive.

For References and Resources cited below, utilize latest edition.

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- New Buildings Institute. The Advanced Lighting Guidelines: 2003 Edition White Salmon, WA: 2003. (http://www.newbuildings.org/lighting.htm#guide).
- Heschong Mahone Group, Pacific Gas and Electric Company on behalf of the California Board for Energy Efficiency Third Party Program. Daylighting in Schools. August 1999. (http://www.pge.com/)
- Ernest Orlando Lawrence Berkely National Laboratory. Tips for Daylighting with Windows: The Integrated Approach. University of California, Berkeley, 1997.

Online Resources

- Daylighting Collaborative. Cool, 1999. http://www.daylighting.org/pubs/v2schools.pdf (1, Sept, 2004).
- Energy Design Resources California Public Utilities Commission. Skylighting & Daylighting Guidelines. http://www.energydesignresources.com/publication/gd/(1, Sept, 2004).
- New Buildings Institute. Daylighting in Schools: Additional Analysis. February 2001. http://www.pge.com/ (1, Sept, 2004).
- Nicklas, M. and G. Bailey. Analysis of the Performance of Students in Daylit Schools, Proceedings of the 1997 Annual Conference. http://www.innovativedesign.net/studentperformance.htm
- Plympton, P., Conway, S. and Epstein, K. Daylighting in Schools: Improving Student Performance and Health at a Price Schools Can Afford. Presented at the American Solar Energy Society Conference, Madison, Wisconsin, 2000. http://www.deptplanetearth.com/nrel_student_performance.htm
- Rensselaer Polytechnic Inst. Lighting Research Center. http://www.lrc.rpi.edu/

DAYLIGHTING (DL) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ DL.1 (5 pts.) Does daylighting provide at least 60 percent of the required light levels for at least 50 percent of the continually occupied instructional space? What daylighting strategies have been used particularly in the classrooms? Please describe briefly.

____

____

____

☐ ☐ ☐ DL.2 (1 pt.) How have siting and site elements influenced the building's access to sunlight? Is the building oriented to maximize day lighting potential? Please describe briefly.

____

____

____

☐ ☐ ☐ DL.3 (1 pt.) Have specific strategies been used (for windows, clerestories, skylights and/ or roof monitors) to control unwanted heat gain and glare? If so, please describe briefly.

____

____

____

☐ ☐ ☐ DL.4 (1 pt.) Do the daylighting and electric lighting systems interact to lower energy use over time? Please describe briefly.

____

____

____

☐ ☐ ☐ DL.5 (1 pt.) Have outside views been incorporated to benefit as many users as possible? Please describe briefly.

____

____

____

ELECTRIC LIGHTING

THE WHAT AND WHY...

The quality of a school's electric lighting system has an enormous impact on the productivity of students, teachers, and staff, and on the facility's operating budget. A Green and Healthy school should provide superior electric lighting by optimizing 'watts per square foot' while retaining visual quality. This can be accomplished by: specifying high efficiency lamps and ballasts, optimizing the number and type of luminaries (light fixtures) for each application, incorporating controls to ensure peak system performance, and integrating complementary electric lighting and daylighting design strategies.

Significant energy savings are possible through the use of high performance lighting. Electric lighting can account for 30 to 50 percent of a school's electric power consumption, so even modest efficiency improvements can mean substantial bottom line savings. In addition, more efficient lighting produces less waste heat, thus reducing the need for cooling, and further reduces operating costs. These savings are achievable now in any school by using readily available lighting equipment and controls.

IMPACT ON OTHER SYSTEMS

Electric lighting systems influence a school's design and interact strongly with daylighting and HVAC systems. Suspended light fixtures, often used for indirect lighting, require elevated ceilings and recessed lighting can add unwanted heat to above-ceiling air plenums. Daylighting strategies that are well-integrated with lighting equipment and controls will reduce the demand for electric light. If addressed by a combination of high efficiency electric lighting equipment and controls, this reduced demand can substantially lower a school's electricity usage. In addition, less electric lighting means less waste heat and, therefore, less demand for cooling. Cooling equipment can be downsized, resulting in first cost and operating cost savings to the school.

RECOMMENDATIONS

Design for High Efficiency and Visual Comfort:

- Develop individual lighting designs for individual rooms or room types (e.g., classrooms, hallways, cafeteria, library, etc.).
- Consider a mix of direct and indirect light sources for each design.
- Optimize each design so that overall lighting levels (foot candles) are as low as possible while still providing optimal illumination for the tasks at hand.
- Avoid over lighting any space.
- Analyze the impact of the lighting system on the HVAC system, and resize as appropriate.
- Design systems to facilitate cleaning and lamp replacement.

ELECTRIC LIGHTING

Specify High Efficiency Lamps and Ballasts:

- Use T-5 or T-8 fluorescent lamps with electronic ballasts for most general lighting applications (classrooms, offices, multipurpose rooms, cafeterias).
- Consider dimmable ballasts, especially in rooms that are daylit.

Optimize the Number and Type of Luminaires (lighting fixtures):

- Use suspended indirect or direct/indirect luminaires in classrooms to provide soft uniform illumination throughout the room.
- Consider incorporating additional accent and directional task lighting for specific uses (display areas, white boards, team areas, etc.)
- Consider the potential for using a smaller number of higher efficiency luminaires to light spaces, resulting in fewer fixtures to purchase, install, maintain, and clean.

Incorporate Controls to Ensure Peak System Performance:

- Use occupancy sensors with manual overrides to control lighting (on-off) in intermittently occupied spaces. Consider scheduled time clocks in other rooms.
- Consider incorporating lighting controls into the facility's overall energy management system, as appropriate.

Integrate Electric Lighting and Daylighting Strategies:

- Treat the electric lighting system as a supplement to natural light; i.e., design for daylighting first and use the electric system to add light as needed during the day while providing sufficient illumination at night.
- Install controls that dim or turn lights off at times when daylight is sufficient.
- Consider controls that provide continuous, rather than stepped, dimming.

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications (Note: Most recent version should be utilized.)

- New Buildings Institute. Advanced Lighting Guidelines. White Salmon, WA: NBI Inc, 2003. (www.newbuildings.org)

- Illuminating Engineering Society of North America. IESNA HB-9-00: Lighting Hand book 9th ed.2000. (www.iesna.org)

- Illuminating Engineering Society of North America. IESNA RP-3-00: Lighting for Educational Facilities. 2000. (www.iesna.org)

- Collaborative for High Performance Schools. CHPS Best Practices Manual Volume II – Design, Electric Lighting and Controls. 2002. (http://www.chps.net/manual/index.htm)

Online Resources (Note: Most recent version should be utilized.)

- Watt Stopper, Inc. www.wattstopper.com
- US Department of Energy. Building Technologies Program – Lighting. http://www.eere.energy.gov/buildings/info/components/lighting/
- Design lights Consortium. http://www.designlights.org
- Energy Star Program. www.energystar.gov Specialized Software Available.
- Illuminating Engineering Society of North America.http://www.iesna.org
- Lawrence Berkeley National Laboratory. Lighting Research Group. http://www.lbl.gov/Specialized Software Available.
- Lighting Research Center, Rensselaer Polytechnic Institute. http://www.lrc.rpi.edu Product Database Available.
- National Clearinghouse for Educational Facilities. http://www.edfacilities.org
- NY City Department of Design & Construction. High Performance Building Guidelines. www.nyc.gov/html/ddc/html/ddcgreen/highperf.html.
- Power Research Institute. Lighting for Schools Controls: Patterns for Design, Electric. http://www.epri.com

ELECTRIC LIGHTING (EL) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ EL.1 (Prerequisite) Does the building 'watts per square foot' lighting level exceed the Kentucky Building Code requirements by at least 5 percent-? Define final watts/ft2 number, and attach COMCheck submittal form.

____

☐ ☐ ☐ EL.2 (1 pt.) Are lighting strategies for each type of space in the facility going to be distinct from each other based on the function and necessary light levels? Please describe briefly.

____

____

____

☐ ☐ ☐ EL.3 (1 pt.) Will individual teachers have control over the lighting conditions of their classrooms? Please describe briefly.

____

____

____

☐ ☐ ☐ EL.4 (1 pt.) Have controls been specified that will help save energy and operating costs? Please describe briefly.

____

____

____

☐ ☐ ☐ EL.5 (1 pt.) Are there plans to train the building owner on the lighting control system? Please describe briefly.

____

____

____

☐ ☐ ☐ EL.6 (1 pt.) Is optimizing the interaction between the electric lighting system and potential day lighting strategies part of the integrated design? Please describe briefly.

____

____

____

ENERGY

ENERGY ANALYSIS

Courtesy of Tim Thornberry

THE WHAT AND WHY…

Computerized energy analysis resources are designed to predict a building's annual (and in some cases, even hourly) energy consumption. They can be used to evaluate the energy impacts of various low-energy strategies (e.g., higher insulation levels, better glazing, increased thermal mass, etc.) in terms of their influence on overall building performance. Combined with accurate cost estimates, energy analysis programs can help create a Green and Healthy school that is optimized in terms of its overall energy performance.

The design team for a Green and Healthy school should begin using an energy analysis tool(s) at the outset of the design process (ideally during pre-design, when sustainable building strategies can be integrated at lowest possible cost) and continue through the bidding/negotiation phase. Reducing energy consumption in a cost-effective manner is good for both the environment and the school district's bottom line. Doing so requires the ability to quickly compare and contrast a variety of alternate design strategies so that the optimal approach can be selected. Fast, accurate estimates of building energy performance – which the current generation of energy analysis tools can provide – are critical to this process.

IMPACT ON OTHER SYSTEMS

Energy analysis tools allow interactions between all of a school's key systems (building shell, windows, lighting, space conditioning) to be analyzed, compared, and optimized for energy performance. This can save a school money on initial construction costs as well as on long-term operating expenses.

For example, a school that combines daylighting strategies and highly efficient electric lighting in its classrooms will require less electricity to illuminate those classrooms – a long-term operating savings. In addition, because the rooms take advantage of daylight and use high efficiency lamps, fewer overall light fixtures may be needed in order to achieve a high quality visual environment. This results in an immediate savings on initial costs. Finally, highly efficient lighting – and, potentially, fewer light fixtures – will result in less waste heat in each classroom. This, in turn, allows the cooling system for the classrooms to be smaller, yielding additional up-front savings.

RECOMMENDATIONS

A wide number of energy design and analysis tools are currently available, some appropriate for the early stages of a project, others developed with the later phases in mind. The following, contains a sampling of tools available. Sources of additional tools can be found in the following 'Industry and Government Resources' section.

ENERGY ANALYSIS

Architectural Design Tools – to be used primarily during early development:

- ENERGY-10, Sustainable Buildings Industry Council (http://www.sbicouncil.org/)
- Building Design Advisor, Lawrence Berkeley National Laboratory (http://gundog.lbl.gov/)
- Energy Scheming, Iris Communications (http://www.oikos.com/esb/37/scheming.html)

Load Calculation and HVAC Sizing – to be used primarily during later development:

- HAP, Carrier Corporation (http://www.corp.carrier.com/)
- TRACE, Trane Corporation (http://www.trane.com/)
- DOE-2, Lawrence Berkeley National Laboratory (http://gundog.lbl.gov)
- BLAST, (http://www.wbdg.org/tools/blast.php)
- Visual DOE, Eley Associates (http://www.eley.com/software/frm_vd.htm)
- EnergyPlus, Lawrence Berkeley National Laboratory (http://gundog.lbl.gov)

REFERENCE STANDARDS AND GUIDELINES

Prescriptive Criteria:

- ASHRAE Standard 90.1-1999. (www.ASHRAE.org)
- IECC 2006

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- American Society of Heating, Refrigerating and Air Conditioning Engineers. ASHRAE Standard 90.1-1999, Energy Standard for Buildings Except Low-Rise Residential Buildings. Atlanta, GA: ASHRAE 2003. (www.ashrae.org)
- IECC 2003 http://www.iccsafe.org/

Online Resources

- Sustainable Buildings Industry Council. ENERGY-10. http://www.sbicouncil.org/store/index.php#Software

- Lawrence Berkeley National Laboratory. Building Design Advisor. http://gundog.lbl.gov

- Iris Communications. Energy Scheming. http://www.oikos.com/esb/37/scheming.html.

- U.S. Department of Energy. Energy Analysis Tools Directory. Office of Building Technology, State & Community Programs. http://www.eere.energy.gov/buildings/tools_directory/

- U.S. Environmental Protection Agency. Energy Star Benchmarking Tool. www.energystar.gov/benchmark.

- U.S. Environmental Protection Agency. Target Finder Tool.

ENERGY ANALYSIS (EA) – CRITERIA CHECKLIST

Yes	No	N/A	
☐	☐	☐	EA.1 (Prerequisite) Has the building been designed to improve the energy usage goals in the Kentucky Building Code by at least 10 percent?
☐	☐	☐	EA.2 (1 pt.) Has an energy analysis tool been used on this project to predict energy consumption? What tool has been used, and what types of analyses were performed?
☐	☐	☐	EA.3 (1 pt.) Have innovative systems been used to meet the building energy goal such as a highly efficient building shell, low energy lighting systems, geothermal system, variable air/water flow systems, heat recovery systems, etc. If yes, describe innovative systems:
☐	☐	☐	EA.4 (5 pts.) Has the building been designed to be Energy Star compliant with respect to annual energy usage? If yes, what is the maximum annual KBTU's/per square foot allowed by Energy Star and the projected actual KBTU's/per square foot:
☐	☐	☐	EA.5 (1 pt.) Is the building designed so that measurement and verification of the energy usage can be accomplished? Please describe briefly.

COMMISSIONING

THE WHAT AND WHY...

Building commissioning is the systematic process of ensuring and documenting that all building systems perform in accordance with design intent, and that they meet the owner's operational needs. The key components of a comprehensive building commissioning plan include: documenting the design intent and operation protocols for all building systems; verifying in-place system performance through well-documented testing and measurement; preparing comprehensive operation and maintenance manuals, coupled with appropriate training of building operations staff; and monitoring system performance on an ongoing basis. Properly implemented, such a plan will ensure that a new school starts its life cycle at the highest performance level possible.

A Green & Healthy School's key systems should be designed to function interactively in ways that create a healthy, productive, environmentally efficient and cost-effective environment for teaching and learning. A robust commissioning process will ensure that these systems actually function as designed and that they meet the needs of the school's students, teachers, and administrators.

Early project participation by a commissioning agent strongly influences the final design and size of a school's HVAC, electrical, and control systems. Properly implemented, commissioning helps ensure that these systems are 'right sized' and that they function at the optimal levels of efficiency and cost effectiveness.

One of the final stages of commissioning is similar to a 'test run' or 'systems check'. It tests, verifies, and fine tunes the performance of key building systems, so that the highest levels of performance are achieved. Correctly implemented, commissioning should improve the building delivery process, increase systems reliability, improve energy performance, ensure good indoor environmental quality, and improve facility operations and maintenance.

IMPACT ON OTHER SYSTEMS

A comprehensive commissioning process should encourage an integrated approach to design of virtually all building systems.

RECOMMENDATIONS

Building Commissioning can be carried out in three basic ways:

- Whole Building
- HVAC and Automated Controls Only Systems
- Electrical Systems Only

The following recommendations should be implemented for any of the above Building Commissioning approaches:

- Engage a commissioning agent at or before the design phase of the project
- Collect and review design intent documentation
- Ensure that commissioning requirements are included in the construction documents
- Develop and utilize a written commissioning plan
- Test and verify installation and functional performance of systems
- Document results and develop a commissioning report

REFERENCE STANDARDS AND GUIDELINES

ASHRAE Guideline 1-1996, The HVAC Commissioning Process. (www.ashrae.org)

USGBC LEED Reference Guide version 2.0 (http://www.usgbc.org/)

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- ASHRAE Guideline 4-1993: Preparation of Operations & Maintenance Documentation for Building Systems (www.ashrae.org)

- ASHRAE Guideline 1-1996: The HVAC Commissioning Process (http://resourcecenter.ashrae.org/store/ashrae/newstore.cgi)

- Heinz, J.A & R.B. Casault. Building Commissioning Handbook, 2nd Edition. Association of Higher Education Facilities Officers. Alexandra, VA: APPA, 2004. (http://www.appa.org/applications/publications/)

Online Resources

- Building Commissioning Association. http://www.bcxa.org/ (1 Aug, 2004).

- Federal Energy Management (FEMA) Program. Building Commissioning Guide. http://www1.eere.energy.gov/femp/pdfs/ccg03_ch1.pdf (1 Aug, 2004)

- Model Commissioning Guide. National Institute of Health. http://des.od.nih.gov/eWeb/research/farhad2/Commissioning/nih_cx_guide/Guide/hh_start.htm (1 Aug, 2004)

COMMISSIONING (C) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ C.1 (5 pts.) Is commissioning being used for HVAC system and building envelope? Please describe briefly.

____

____

☐ ☐ ☐ C1.1 (1 pt.) Add 1 additional point for commissioning 3 or more of the following: lighting, plumbing, IT, power distribution, alarm systems (fire, security, intrusion). Submit description of additional systems being commissioned and how commissioning is being accomplished.

____

____

____

☐ ☐ ☐ C.2 (1 pt.) At what stage of the design process was the commissioning agent engaged? If commissioning is being performed, has the commissioning agent been brought onboard during the design phase prior to bidding? Describe design phase commissioning.

____

____

____

☐ ☐ ☐ C.3 (1 pt.) Please describe briefly the key elements of the commissioning plan.

____

____

☐ ☐ ☐ C.4 (1 pt.) Were the functional performance of key systems tested and verified?

____

☐ ☐ ☐ C.5 (1 pt.) Are the results documented in a commissioning report?

____

ENVIRONMENT

ENVIRONMENTALLY RESPONSIVE SITE PLANNING

THE WHAT AND WHY…

A Green and Healthy school should be located on a site that helps the school function at peak efficiency, minimizes adverse impacts on the local environment, and serves as an amenity for the surrounding community. A Green and Healthy site should be planned to conserve existing natural areas and restore damaged ones, minimize storm water runoff and control erosion, enhance the school's Green and Healthy features, reduce 'heat islands' and minimize light pollution.

A Green and Healthy site is good for the local and regional environment. It can also help reduce a school's operating costs by enhancing, rather than inhibiting, the Green and Healthy features of a facility (e.g., energy conservation, water conservation, renewable energy, safety and security, etc.).

A well-planned, Green and Healthy site can also be an exciting natural laboratory for students.

IMPACT ON OTHER SYSTEMS

Site conditions impact virtually every system in a building. A well-integrated design and site planning process will ensure that the site reinforces the building (and vice versa) and that both components operate at peak levels of performance.

RECOMMENDATIONS

Conserve Existing Natural Areas and Restore Damaged Ones:

- Preserve local vegetation in place, especially mature trees.
- Reduce parking and building 'footprints.'
- Landscape with indigenous plants to restore damaged areas of the site.

Minimize Storm water Runoff and Control Erosion:

- Design so that at a minimum, there is no net increase in storm water runoff from the site after the school is built.
- Reduce impervious surfaces (such as parking lots, paved paths, etc.) that contribute to runoff.
- Maximize on-site storm water infiltration.
- Consider providing for on-site storm water retention, such as a rain garden.
- Use vegetation to keep soil in place.
- Consider anti-erosion grading and stabilization techniques.
- Minimize storm water runoff during construction.

Use the Site to Enhance the School's Green and Healthy Features:

- Orient the building on the site to take advantage of the sun: (usually along an east-west axis to maximize southern exposure), the prevailing breezes, shade trees and any landforms that might reduce the building's energy use; increase its access to natural daylight; enhance its acoustical environment; and/or improve its security.

Reduce Heat Islands:
- Reduce developed areas, such as parking lots, that are much hotter than surrounding, undeveloped areas
- Use landscape elements (preferably existing trees and vegetation) to shade roads, walkways, and parking lots.
- Consider using light colored materials for the school's roof to reflect, rather than absorb, sunlight.

Reduce Light Pollution:
- Design site lighting so as to minimize contribution to nighttime sky glow.
- Consider outdoor lights with covered tops so that the light shines down, rather than up into the nighttime sky.

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Barnett, Dianna L. & William D. Browning. A Primer on Sustainable Building, 2nd edition. Snowmass, CO: Rocky Mountain Institute, 1999. (http://www.rmi.org/store/pid960.php)

Online Resources

- Smart Communities Network. http://www.smartcommunities.ncat.org/

- Energy Star Reflective Roof Products, U.S. Environmental Protection Agency. www.energystar.gov/index.cfm?c=roof_prods.pr_roof_products

- Heat Island Group, Lawrence Berkeley National Laboratory. http://eetd.lbl.gov/HeatIsland/

- Guiding Principles of Sustainable Design. Chapter 5: Site Design, National Park Service. http://www.nps.gov/dsc/d_publications/d_1_gpsd.htm

- International Dark Sky Association. http://www.darksky.org/

- Sustainable Site Design, National Park Service. www.nps.gov/dsc/d_publications/d_1_gpsd_5_ch5.htm. (1 Aug, 2004).)

- Lighting Code Handbook V1.14 Sept. 2002, International Dark-Sky Association www.darksky.org

ENVIRONMENTALLY RESPONSIVE SITE PLANNING (SP) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ SP.1 (1 pt.) Have provisions been made for good pedestrian, mass transit, and/or bicycle access? Have safe routes to the school been identified? Please describe briefly.

____

____

____

☐ ☐ ☐ SP.2 (1 pt.) Are there areas of the site and/or the surrounding community that could be used as 'outdoor laboratories' for teaching? Please describe briefly.

____

____

☐ ☐ ☐ SP.3 (1 pt.) Does the design preserve and/or restore existing natural areas of the site? Does the design help control storm water runoff with various measures such as pervious paving, storm water retention features and strategic landscaping? Briefly describe.

____

____

____

☐ ☐ ☐ SP.4 (1 pt.) Is environmental landscaping (xeroscaping, indigenous and low-irrigation vegetation) integrated into the site design to reduce the need for costly maintenance of grass lawns? Please describe briefly.

____

____

____

☐ ☐ ☐ SP.5 (1 pt.) Is the building, particularly the classroom wings, oriented in a predominantly east-west direction with daylighting glazing facing north and/or south to facilitate access to day light? Please describe briefly.

____

____

____

☐ ☐ ☐ SP.6 (1 pt.) Have landscaping strategies, particularly tree planting been used to enhance the building's high performance features (i.e. by providing shade where it's needed but not blocking sunlight that's used for day lighting)? Please describe briefly.

____

____

WATER EFFICIENCY

THE WHAT AND WHY…

Fresh water is becoming an increasingly scarce resource. Even in areas of Kentucky where access to water is not an issue, the collection treatment and pumping of water to end-users consumes large amounts of energy. A Green and Healthy school should reduce and control water runoff from its site, consume fresh water as efficiently as possible, and recover and reuse gray water to the extent feasible.

Basic efficiency measures can reduce a school's water usage by 30% or more. These reductions help the environment, locally and regionally. They also lower a school's operating expenses. The technologies and techniques used to conserve water – especially landscaping, water treatment and recycling strategies – can be used to help instruct students about ecology and the environment.

IMPACT ON OTHER SYSTEMS

Using less hot water will reduce energy costs. This reduction should be factored in to all life cycle cost analyses performed for the facility.

Onsite rainwater capture/retention can reduce the size of storm water drains.

RECOMMENDATIONS

WATER EFFICIENT LANDSCAPING:

- Specify hardy, native vegetation.
- Consider using an irrigation system for athletic fields only, not for plantings near buildings or in parking lots.
- Use high efficiency irrigation technology (e.g., drip irrigation in lieu of sprinklers).
- Use captured rain or recycled site water for irrigation. 'Design in' cisterns for capturing rain water.

WATER USE REDUCTION:

- Set water use goals for the school. Recommendation: 20% less than the baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements.
- Specify water conserving plumbing fixtures that exceed Energy Policy Act of 1992 requirements.
- Specify high efficiency equipment (dishwashers, laundry, cooling towers).

- Consider automatic lavatory faucet shut-off controls.
- Consider low-flow showerheads with pause control.
- Consider using recycled or rain water for HVAC/process make-up water.
- Consider the use of waterless urinals.

INNOVATIVE WASTEWATER TREATMENT:

- Decrease use of potable water for sewage conveyance by using gray and or black water systems. Opportunities include toilet flushing, landscape irrigation, etc.
- Consider on-site wastewater treatment, including full or partial "solar aquatics" systems.

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Vickers, Amy. Handbook of water use and conservation. Amherst, MA: Waterplow Press, 2002. (http://www.waterplowpress.com/index.html)

Online Resources

- American Rainwater Catchment Association. http://www.arcsa-usa.org/

- Innovative Design. Raincatcher Design Tool. http://www.innovativedesign.net/raincatcher_a.htm Specialized Software Available.

- National Park Service. Guiding Principles of Sustainable Design: Chapter 8. http://www.nps.gov/dsc/dsgncnstr/gpsd/

- National Clearinghouse for Educational Facilities. http://www.edfacilities.org Specialized Software Available.

- NY City Department of Design and Construction. High Performance Building Guidelines. http://www.nyc.gov/html/ddc/html/ddcgreen/highperf.html

- Water Alliance for Voluntary Efficiency (WAVE) http://es.epa.gov/partners/wave/wave.html Searchable database available.

WATER EFFICIENCY (WE) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ WE.1 (1 pt.) Using the Energy Policy Act (EPACT) of 1992, has a reduced water usage goal for the school been established? If yes, what is the annual goal?

___

___

___

☐ ☐ ☐ WE.2 (1 pt.) Have water efficient fixtures, including dual-flush water closets, low-flow shower heads; and automatic lavatory faucet shut off control; been considered? If yes, describe system:

___

___

___

☐ ☐ ☐ WE.3 (1 pt.) Is water efficient landscaping part of the site design? If yes, describe briefly:

___

___

___

☐ ☐ ☐ WE.4 (1 pt.) Is there either no irrigation system, or is irrigation used only for the athletic fields?

___

☐ ☐ ☐ WE.5 Have innovative rainwater collection (2 pts.) and/or wastewater/ gray water (2 pts.) treatment, and/or other reuse techniques (2 pts.) been incorporated? If yes, describe.

___

___

___

ENVIRONMENTALLY PREFERABLE MATERIALS, PRODUCTS AND PRACTICES

THE WHAT AND WHY...

Building materials can have a significant impact on the environment and on human health. To the maximum extent possible, a Green and Healthy school should be constructed of durable, non-toxic materials that are high in recycled content and are themselves easily recycled. Preference should be given to locally manufactured materials and those derived from sustainable-yield processes. The school itself should be designed to facilitate recycling. In addition, waste should be minimized during construction.

Some building materials contain toxic substances that can harm workers during construction, and may also be harmful to students, teachers, and staff after occupancy. In addition, the mining, harvesting, and production of certain building materials can pollute our air and water. They may also destroy habitats and deplete natural resources. Transporting building products long distances also contributes to pollution and energy waste.

Careful selection of materials can reduce or eliminate these problems, resulting in a school that not only helps the environment, but also contributes to the health and well-being of its occupants. Many of the materials selected – particularly those with recycled content – can serve as the basis for lessons on ecology and the environment, as can areas within the building designed for on-site recycling or source waste separation.

IMPACT ON OTHER SYSTEMS

Building products and materials will impact the indoor air, acoustic, and visual quality of a school. They can also affect operation and maintenance procedures. When new materials are used, new procedures may be required for their maintenance and upkeep. These new procedures should not be more complicated, costly, or time consuming than those associated with standard products, but they will be new, and so maintenance staff will require some training to implement them effectively.

RECOMMENDATIONS

Design to Facilitate Recycling:

- 'Design in' an area within the building dedicated to separating, collecting, and storing materials for recycling, including paper, glass, plastics, and metals.
- Consider where and how materials will be collected and brought to the central area, and allow space for easy collection and transport.

ENVIRONMENTALLY PREFERABLE MATERIALS, PRODUCTS AND PRACTICES

Reduce the Amount of Construction Waste that Goes to Landfill:

- During construction, develop and implement a management plan for sorting and recycling construction waste.
- Consider a goal of recycling or salvaging 50% (by weight)

Specify Materials and Products that are Environmentally Efficient:

- Specify materials, especially timber, harvested on a sustainable-yield basis.
- Consider a goal of having 50% of the school's wood-based materials certified in accordance with the Forest Stewardship Council Guidelines for wood building components.
- Give preference to locally manufactured materials and products, which stimulate the local economy and reduce transport distances.
- Consider specifying salvaged or refurbished materials, as appropriate.

Maximize Recycled Content of All New Materials:

- Use EPA-designated recycled content products to the maximum practicable extent.
- Within an acceptable category of product, use materials and assemblies with the highest available percentage of post-consumer or post-industrial recycled content.
- Consider a goal of having 25% of the school's building materials contain a weighted average of 20% post-consumer or 40% post-industrial recycled content.

Eliminate Materials that Pollute or are Toxic during Manufacture, Use or Reuse:

- Within an acceptable category of product, use materials or assemblies with the lowest levels of volatile organic compounds (VOCs).
- Eliminate the use of chlorofluorocarbons (CFCs) and hydro chlorofluorocarbons (HCFCs) as refrigerants in all HVAC systems.
- Evaluate the potential impact of specified materials on the indoor air quality of the school

REFERENCE STANDARDS AND GUIDELINES

Forest Stewardship Council. Structure and content of Forest Stewardship Standards (www.fsc.org).
Environmental Protection Agency. Comprehensive Procurement Guidelines. (www.epa.gov/cpg/products.htm).

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- American Institute of Architects (AIA).The Environmental Resource Guide. Washington, DC: John Wiley & Sons, 1992. (www.wiley.com)

- The Architectural Machine. The Green Building Resource Guide. (www.greenguide.com)

- California EPA. Designing with Vision: A Technical Manual for Material Choices in Sustainable Construction. Sacramento, CA: Integrated Waste management Board, 2000. (www.ciwmb.ca.gov/ConDemo/Pubs.htm)

- Wilson, Alex, Malin N., Wiechers, T. and L. Strain. The GreenSpec® Directory: Product Directory with Guideline Specification, 3rd Edition. Building Green, Inc, 2003.

- Mendler, Sandra and Odell William. HOK Guidebook to sustainable design. Hoboken, NJ: John Wiley & Sons, 2000. (www.wiley.com)

Online Resources

- California Environmental Protection Agency. Designing with Vision: A Technical Manual for Material Choices in Sustainable Construction. Sacramento, CA: Integrated Waste Management Board, 2000. http://www.ciwmb.ca.gov/ConDemo/Pubs.htm

- California Integrated Waste Management Board. Construction and Demolition Waste Recycling Information. http://www.ciwmb.ca.gov/

- California Integrated Waste Management Board. Recycled Content Product Database. http://www.ciwmb.ca.gov/rcp

- Center for Resourceful Building Technology. http://www.crbt.org

- Certified Forest Products Council. http://www.metafore.org/index.php?p=Forest_Certification_Resource_Center&s=147

- Environmental Building News. http://www.buildinggreen.com/

- Forest Stewardship Council. http://www.fsc.org/en/

- Green Seal. http://www.greenseal.org/

- GSA Environmental Strategies and Safety Division. Construction Waste Management Database. http://www.wbdg.org/missingwbdg.php (1Sept, 2004). Online Database of Recyclers Available.

- Rainforest Alliance. http://www.rainforest-alliance.org/

- Scientific Certification Systems. http://www.scscertified.com/

- Sustainable Building Sourcebook. http://www.greenbuilder.com/sourcebook/

- US EPA. EPA Comprehensive Guide for Procurement of Products Containing Recovered Materials. http://www.epa.gov/epaoswer/non-hw/procure/index.htm

- US EPA. Comprehensive Procurement Guidelines. http://www.epa.gov/epaoswer/non-hw/procure/index.htm

ENVIRONMENTALLY PREFERABLE MATERIALS AND PRODUCTS (PM) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ PM.1 (1 pt.) If there was an existing building on site, was a significant portion of the existing building and /or envelope preserved? Please describe briefly.

____

____

____

☐ ☐ ☐ PM.2 (1 pt.) Were any on site materials reused for the project, such as structural steel beams, crushed concrete serving as aggregate, land clearing waste, etc? Please describe briefly.

____

____

____

☐ ☐ ☐ PM.3 (1 pt.) Were locally available salvage materials used? Please describe briefly.

____

____

____

☐ ☐ ☐ PM.4 (1 pt.) What environmentally preferable materials and products have been used for the facility and where will they be used? What materials will have recycled content? Which materials will be highly durable and east to maintain?

____

____

☐ ☐ ☐ PM.5 (1 pt.) Is recycling "designed-in" as an integral part of the building to collect and store recyclable materials? How does the design facilitate recycling by students and staff?

____

____

☐ ☐ ☐ PM.6 (1 pt.) Were specifications developed to limit construction waste? Describe desired parameters and how they were executed.

____

____

____

RENEWABLE ENERGY

THE WHAT AND WHY...

Renewable energy (particularly geothermal, solar and wind energy) is a free resource, which, if effectively captured and used, can significantly reduce a school's operating costs. A Green and Healthy school should maximize the cost-effective use of renewable systems to meet its energy needs. The school district should also consider purchasing 'green power.'

Renewable energy systems reduce a school's overall operating expenses and play a significant role in preserving the environment. Many of the techniques employed (for example, daylighting and natural ventilation) also contribute to a high quality learning environment. Other strategies, particularly solar thermal, wind, and photovoltaic applications, are exciting technologies that can be used to teach students about science, ecology, and the environment.

IMPACT ON OTHER SYSTEMS

Renewable energy systems closely interact with the heating/ventilating/air conditioning (HVAC), hot water and electric power systems in a building. Passive solar and solar thermal systems provide heat, which reduces demand on the HVAC system. Daylighting reduces the need for electric lighting, while natural ventilation reduces the need for mechanical venting. Solar hot water replaces mechanically heated water, and geothermal heat pumps replace conventional heating/air conditioning equipment. Wind and photovoltaics provide electricity, thus reducing the need for utility-provided power.

RECOMMENDATIONS

During the design process, the developers of a Green and Healthy school should systematically evaluate and consider integrating one or more of the following renewable energy systems into the building:

- Daylighting – maximize the amount of natural light throughout the school, while avoiding over lighting spaces.
- Passive Solar Heating – to meet some of the school's heating needs, capture the sun's energy through south-facing windows.
- Solar Hot Water – capture the sun's energy in ground- or roof-mounted systems that provide some or all of a school's hot water needs.
- Solar Thermal – capture the sun's energy in ground- or roof- mounted systems to help heat the school or, using an absorption system, to help cool it.
- Geothermal Heat Pump – transfer heat to and from the earth to generate energy-efficient heating and cooling.
- Natural Ventilation – design to facilitate the circulation of 'non-conditioned' outside air through the building and to take advantage of prevailing breezes.
- Wind – use wind energy to generate on-site electricity.

RENEWABLE ENERGY

- Photovoltaics – use ground-mounted, roof-mounted, or building-integrated systems to transform sunlight into electricity.
- Green Power – purchase power from producers who generate electricity from renewable sources.

For References and Resources cited below, utilize latest edition.

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Patel, Mukund R. Wind and solar power systems. Boca Ratón, FL: CRC Press, 1999.

Online Resources

- American Solar Energy Society. www.ases.org. (1 Aug, 2004).
- American Wind Energy Association. http://www.awea.org (1 Aug, 2004). Online Bookstore Available.
- Energy Efficiency and Renewable Energy Network.www.eere.energy.gov. (1 Aug, 2004).
- Geothermal Heat Pump Consortium. www.geoexchange.org. (1 Aug, 2004).
- Geoexchange.www.geoexchange.org/publications/software004.htm. (1 Aug, 2004). Online Video Available.
- Green-E Renewable Electricity Program.www.green-e.org. (1 Aug, 2004).
- Interstate Renewable Energy Council.www.dsireusa.org. Database of State Incentives for Renewable Energy Available.
- Renewable Energy: An Overview.www.nrel.gov/docs/fy01osti/27955.pdf. (1 Aug, 2004). Glossary Available Online.
- The Renewable Resource Data Center. http://rredc.nrel.gov/. (1 Aug, 2004).
- Solar Energy Industries Association.www.seia.org. (1 Aug, 2004).
- Sustainable Buildings Industry Council.www.sbicouncil.org. (1 Aug, 2004). Online Training Videos Available.
- U.S. Department of Energy. Energy Design Guidelines for High Performance Schools. http://www.eere.energy.gov/buildings/energysmartschools/architects_engineers.html (1 Aug, 2004). Good Online source.

RENEWABLE ENERGY SYSTEMS (RES) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ RES.1 (2 pts.) Are renewable energy strategies being utilized for the school? If yes, please briefly describe them.

____

____

____

☐ ☐ ☐ RES.2 (1 pt.) Were renewable energy strategies utilized in the Energy Analysis? If so, how much annual energy usage was saved?

____

____

____

☐ ☐ ☐ RES.3 (1 pt.) Have available renewable energy incentives been considered when evaluating various renewable energy technologies and systems? Submit specifics on energy incentives considered.

____

____

____

☐ ☐ ☐ RES.4 (1 pt.) Are there non-energy benefits associated with the proposed renewable energy systems; for example: peak shaving benefits, off-setting cost advantages (e.g. using photovoltaics as building materials; using the renewable system as a teaching tool; etc.)? If yes, describe them.

____

____

____

HEALTH & COMFORT

VISUAL COMFORT

THE WHAT AND WHY...

For both students and teachers, performing visual tasks is a central component of the learning process. A Green and Healthy school should provide a rich visual environment – one that enhances, rather than hinders, learning and teaching. These environments are achieved by carefully integrating natural and artificial lighting strategies, by balancing the quantity and quality of light in each room, and by controlling or eliminating glare.

Students spend much of their day engaged in visual tasks – writing, reading printed material, reading from visual display terminals, or reading from blackboards, whiteboards, and overheads. Further, they must constantly adjust their vision from 'heads up' to 'heads down' positions and back again. Inadequate lighting and/or glare in these situations can seriously impact a student's ability to learn. On the other hand, a comfortable, productive visual environment – one that takes into account more than simply the amount of light hitting the desk top – will enhance the learning experience for both students and teachers.

IMPACT ON OTHER SYSTEMS

Visual comfort results from a well-designed, well-integrated combination of natural and artificial lighting systems. Any strategy for enhancing the visual environment will therefore strongly impact the size and configuration of both of these systems (e.g., number, type, and placement of windows; number, type, and placement of light fixtures; etc.). The final configurations will, in turn, impact a school's heating and cooling systems.

An optimized overall design will provide a high quality luminous environment and will use daylight effectively to reduce the need for artificial lighting. Less artificial lighting means lower electricity bills and less waste heat which, in turn, reduces the demand for cooling and lowers overall HVAC operating expenses.

RECOMMENDATIONS

Integrate Natural and Artificial Lighting Strategies:

- Take the amount of daylight entering a room into account when designing and sizing the artificial lighing system for that room.
- Provide controls that turn off lights when sufficient daylight exists.
  - Consider dimming controls that continuously adjust lighting levels to respond to daylight conditions.

Balance the Quantity and Quality of Light in Each Room:

- Avoid excessively high horizontal light levels.
  - Use the newly revised 9th edition of the Illuminating Engineering Society of North America's Lighting Handbook: Design and Application as a guide
  - Refer to the New Buildings Institute's Advanced Lighting Guidelines for strategies to achieve good lighting design.
- Design for 'uniformity with flexibility':
  - Illuminate spaces as uniformly as possible, avoiding shadows or sharp distinctions between dark and light
  - As appropriate, provide task or accent lighting to meet specific needs (e.g., display areas, white boards, team areas, etc.)
  - Develop individual lighting strategies for individual rooms or room types (e.g., classrooms, hallways, cafeteria, library, etc.). Avoid 'one size fits all' approaches

Control or Eliminate Glare:

- Consider how light sources in a room will impact work surfaces. Design to avoid:
  - Direct glare from sources in front or to the side of a work area
  - Overhead glare from sources above the work area
  - Reflected glare from highly reflective surfaces, including glossy paper and computer terminals
- As methods of control, consider increasing the brightness of surrounding surfaces, decreasing the brightness of light sources, or both.
- Consider interior (shades, louvers, blinds) or exterior (overhangs, trees) strategies for filtering daylight and controlling glare from sunlight.
- Consider indirect lighting applications.

REFERENCE STANDARDS AND GUIDELINES

- Illumination Society of North America (IESNA). IESNA Lighting Handbook 9th Edition. New York: IESNA, 2000. www.iesna.org
- New Buildings Institute. Advanced Lighting Guidelines 2003 Edition. White Salmon, WA: NBI, 2003. www.newbuildings.org/lighting.htm#guide

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Illuminating Engineering Society of North America, IESNA RP-3-00: Lighting for Educational Facilities. New York: IESNA, 2000. https://www.iesna.org/shop/item-detail.cfm?ID=RP-3-00&storeid=1

Online Resources

- Design lights Consortium. http://www.designlights.org/
- Electric Power Research Institute. Controls: Patterns for Design. http://my.epri.com/
- Energy Star Program. http://www.energystar.gov/
- Lighting Research Center, Rensselaer Polytechnic Inst. Case Studies. www.lrc.rpi.edu.

VISUAL COMFORT (VC) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ VC.1 (1 pt.) Do the daylighting and electric lighting system designs provide illumination as uniformly as possible, using task or accent lighting as appropriate to meet specific needs? If yes, what tools have been used to model the interactions of both these systems in terms of their impacts on visual comfort?

____

____

____

☐ ☐ ☐ VC.2 (1 pt.) What shading strategies (internal and external) have been selected for exterior windows?

____

____

____

☐ ☐ ☐ VC.3 (1 pt.) Have the color and texture of wall, floor, and ceiling surfaces been taken into account in terms of their interaction with the lighting and their combined impact on the visual environment? If so, please explain.

____

____

____

____

THERMAL COMFORT

THE WHAT AND WHY...

Thermal comfort is a function of the temperature and relative humidity in a room. While the building code requires minimum levels of temperature and humidity in occupied spaces, it does not specify how these levels are to be achieved, leaving open the possibility that individual areas within a room may be too hot or too cold. Further, code levels are only minimums – the optimal levels for specific applications may be quite different. A Green and Healthy school should ensure that rooms and HVAC systems are designed to allow temperature and humidity levels to remain within the 'comfort zone' at all points in an occupied space.

Thermal comfort is an important variable in student and teacher performance. Hot, stuffy rooms – and cold, drafty ones – reduce attention spans and limit productivity. They also waste energy, adding unnecessary cost to a school's bottom line. Excessively high humidity levels can also contribute to mold and mildew.

IMPACT ON OTHER SYSTEMS

Thermal comfort is strongly influenced by how a specific room is designed. For example:

- How much heat do its walls and roof gain or lose?
- How much sunlight do its windows let in?
- Can the windows be opened?
- How effectively does the HVAC system meets the specific needs of that room?

Balancing these two components – room design and HVAC system design – is a back-and-forth process that continues throughout all stages of new facility development.

In a Green and Healthy school, the process results in an optimal blend of both components: rooms configured for high student and teacher productivity served by an energy efficient HVAC system. The system is designed, sized, and controlled to maintain thermal comfort under all conditions.

RECOMMENDATIONS

- Comply with American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 55-1992 (with Addenda) Thermal Environmental Conditions for Human Occupancy.
- When a design incorporates natural ventilation (e.g., opening windows to provide direct outdoor air during temperate times of the year), consider adjusting the requirements of ASHRAE Standard 55-1992 to account for the impact.

THERMAL COMFORT

- Analyze room configurations and HVAC distribution layouts to ensure that all parts of a room are receiving adequate ventilation.
- Analyze placement of windows and skylights and provide adequate, controllable shading to avoid 'hot spots' caused by direct sunlight.
- Consider providing a temperature and humidity monitoring system to ensure optimal thermal comfort performance.
- Evaluate the inclusion of temperature and humidity monitoring as part of the building's overall energy management system.
- Consider providing controls in each room to offer teachers more direct control over thermal comfort.
- Evaluate the potential impact of such controls on the overall efficiency of the HVAC system.

REFERENCE STANDARDS AND GUIDELINES

USGBC LEED Rating System v2.0

ASHRAE Standard 55-1992 (with Addenda)

The 2007 Kentucky Building Code

Yes No N/A

☐ ☐ ☐ TC.1 (Prerequisite) Has the building been designed to be in compliance with ASHRAE Standard 55?

____

☐ ☐ ☐ TC.2 (1 pt.) Can room temperature for all instructional areas throughout the building be maintained individually?

____

☐ ☐ ☐ TC.3 (1 pt.) Have the outdoor ventilation systems been designed to limit the maximum building humidity level at 55% RH? If yes, describe how.

____

____

____

☐ ☐ ☐ TC.4 (1 pt.) Can individual space temperature and building humidity be trended? Please describe briefly.

____

____

☐ ☐ ☐ TC.5 (1 pt.) Is the building designed to set back room temperature during the unoccupied periods? If so, can individual room temperatures be over-ridden during unoccupied periods? If so, describe how.

____

____

____

☐ ☐ ☐ TC.6 (1 pt.) Have HVAC air distribution layouts been designed to ensure all parts of a room receive adequate ventilation? Please describe briefly.

____

____

____

HEALTH & COMFORT

ACOUSTIC COMFORT

THE WHAT AND WHY...

Parents, students, teachers, and administrators across the country are increasingly concerned that classroom acoustics are inadequate for proper learning. Noise from outside the school (vehicular traffic, aircraft flyover, etc.), hallways (foot traffic and conversation), other classrooms (amplified sound systems and inadequate sound attenuation), mechanical equipment (compressors, boilers and ventilation systems), and even sound from within the classroom itself (reverberation) can all hamper students' concentration. The message has even reached the Access Board, the organization that supports implementation of the Americans with Disabilities Act, which has received complaints concerning the effects of bad acoustics on hearing-impaired students. A Green and Healthy School should address these potential problems and ensure a superior acoustical environment by:

- Reducing sound reverberation time inside the classroom;
- Limiting transmission of noise from outside the classroom;
- Minimizing background noise from the building's heating, ventilating, and air conditioning system.

Trying to hear in a poor acoustical environment is like trying to read in a room with the lights off: stress increases, concentration decreases, and as a result learning is impaired. This is especially true for younger students (the ability to sort meaningful signals from noise is not fully developed until children reach their teens), those for whom English is a second language, and those with hearing impairments. Although little consideration has historically been given to acoustic design in classrooms – as opposed to lighting and ventilation – this situation is beginning to change. The information and tools needed to design classrooms for high acoustical performance now exist. They can be used to ensure that any newly constructed classroom provides an acoustic environment that positively enhances the learning experience for students and teachers.

IMPACT ON OTHER SYSTEMS

When classroom ceilings are designed to optimize daylighting, suspended acoustical ceilings are often eliminated and the exposed surfaces are painted with highly reflective paint to throw daylight well into the classroom. The sound absorption value lost by the absence of the suspended ceiling must be replaced in other ways to prevent the classroom from becoming highly reverberant. In situations where roof monitors are used, parts of the acoustical ceiling are also removed. However, the open space under the skylights and monitors can also dampen reverberation and may compensate for the lost portions of the ceiling.

RECOMMENDATIONS

Reduce sound reverberation time in classrooms to 0.5 seconds in 500, 1000, 2000 and 4000 Hz Octave Bands

- Configure classrooms to damp rather than magnify sound reverberation.
- Specify sound absorbing materials (especially on exposed surfaces) to damp reverberation.

LIMIT TRANSMISSION OF NOISE FROM OUTSIDE THE CLASSROOM:

- Design high Sound Transmission Class (STC) walls between:
  - Classrooms adjacent to laboratories (STC-50)
  - Classrooms adjacent to music practice or mechanical equipment rooms (STC-55)
  - Design exterior walls, windows, and roofs such that noise transmission (except for intermittent noise such as airplane flyovers) is reduced to the same levels as background noise inside the classroom (i.e., RC 30 – 35)
- Minimize background noise from the building's heating, ventilating, and air conditioning system
- Design the system to achieve the following RC levels, based on the Room Criterion method explained in the ASHRAE Applications Handbook:
  - Ideal RC-25N
  - Acceptable RC-30N
  - Maximum RC-35N
- Avoid locating mechanical equipment rooms next to classrooms.
- Recognize that sound control is more difficult in unducted rooftop or through-the-wall units than in central air handling systems.
- If using ducted rooftop units, ensure that they are mounted on spring isolators.
- Consider using larger ducts with lower air flow speeds (1000 feet per minute maximum).
- Select diffusers with low noise ratings (NC-20 to NC-23).

REFERENCE STANDARDS AND GUIDELINES

Acoustical Society of America ANSI/ASA S12.60-2002

ASHRAE 1999 Applications Handbook

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Apfel, Robert E. Deaf Architects & Blind Acousticians? A Guide to the Principles of Sound Design. New Haven: Apple Enterprises Press, 1998.

- Acoustical Society of America. ANSI/ASA S12.60-2002: American National Standard Acoustical Performance Criteria, Design Requirements and Guidelines for Schools. Melville, NY: ASA, 2002. (http://asa.aip.org/classrooms/acoustics-booklet.htm)

- American Society of Heating, Refrigerating and Air Conditioning Engineers. 1999 Applications Handbook, Atlanta, GA: ASHRAE 2003. (www.ashrae.org)

- Sleeper, Ramsey. The American Institute of Architects. Architectural Graphic Standards, Tenth Edition. Washington, DC: John Wiley & Sons. Pages 63-70.

Online Resources

- American Speech-Hearing-Language Association. http://www.asha.org/default.htm (1 Aug, 2004). Online course available.

- The Classroom Acoustics Coalition. Guidelines for Classroom Acoustics in New Construction. http://www.nonoise.org/quietnet/qc/workshop/dec97shp/guide.htm

- Institute of Noise Control Engineering. http://www.inceusa.org/

- National Council of Acoustical Consultants. http://www.ncac.com/

- National Clearinghouse for Educational Facilities http://www.edfacilities.org/rl/acoustics.cfm

- Noise Pollution Clearinghouse. http://www.nonoise.org/quietnet/qc/

- Quiet Classrooms. Classroom Design for Good Hearing. http://quietclassrooms.org/

- Quiet Classrooms. Listening for Learning. http://quietclassrooms.org/

- U. S. Access Board. Acoustics Fact sheet. http://www.access-board.gov/acoustic/index.htm

ACOUSTIC COMFORT (AC) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ AC.1 (1 pt.) Are all classrooms located so there is no exposure to sources of outside noise (aircraft, highways, industrial sites)? If so, what measures are being used to reduce the impact of this noise?

____

____

____

☐ ☐ ☐ AC.2 (1 pt.) Are all classrooms located away from sources of inside noise (HVAC, band, and music rooms)? If so, what measures are proposed to reduce the impact of this noise? What is the STC rating of walls between classrooms and adjacent noisy spaces?

____

____

☐ ☐ ☐ AC.3 (1 pt.) Do the proposed materials and finishes, especially those used in the classrooms, contribute to reducing sound reverberation? What RC level have classrooms been designed to? Please describe briefly.

____

____

____

☐ ☐ ☐ AC.4 (1 pt.) Have the classrooms been designed to enhance projected acoustic performance? If so, how?

____

____

____

☐ ☐ ☐ AC.5 (1 pt.) Will the proposed heating/ventilating/air conditioning (HVAC) system for the classrooms create noise? If so, how will the impacts of this noise be dealt with?

____

____

____

☐ ☐ ☐ AC.6 (1 pt.) Has a sound enhancement been used in at least half the classrooms? If so, please describe briefly.

____

____

HEALTH & COMFORT

INDOOR AIR QUALITY

THE WHAT AND WHY...

The quality of the air inside a school is critical to the health and performance of children, teachers, and staff. A Green and Healthy school should provide superior indoor air quality by: controlling the sources of contamination, providing adequate ventilation, preventing unwanted moisture accumulation, and implementing effective operations and maintenance procedures.

According to the U.S. Environmental Protection Agency, the concentration of pollutants inside a building may be two to five times higher than outside levels. Children are particularly vulnerable to such pollutants because their breathing and metabolic rates are high relative to their size – much higher than for adults. Maintaining a high level of indoor air quality is therefore a critical issue for schools to address. According to the EPA, failure to do so may:

- Negatively impact student and teacher performance;
- Increase the potential for long- and short-term health problems for students and staff;
- Increase absenteeism;
- Accelerate deterioration and reduce efficiency of the school's physical plant;
- Create negative publicity that could damage a school's image;
- Create potential liability problems.

'Designing in' superior indoor air quality from the beginning is the most cost-effective way to avoid these negative outcomes and ensure a healthy and productive indoor environment.

IMPACT ON OTHER SYSTEMS

Increasing ventilation to improve indoor air quality will have an impact on the size and operation of the overall HVAC system. The entire system should be "right sized" and make use of appropriate technology to provide the optimum level of ventilation air in the most energy and cost effective manner possible.

RECOMMENDATIONS

Control Sources of Contamination:

- Test the site for sources of contamination: radon, hazardous waste, fumes from nearby industrial or agricultural uses.
- Locate sources of exhaust fumes (e.g. from buses, cars, trucks, emergency generators, fume hood exhausts, or sewer vents) away from air intake vents.
- Consider recessed grates, 'walk off' mats, and other techniques to reduce the amount of dirt entering the building.
- Specify materials and furnishings that are low emitters of indoor air contaminants. Consider:
  - Adhesives and sealants with low levels of volatile organic compounds (VOCs);
  - Paints and coatings that meet or exceed the VOC and chemical component limits of the Green Seal requirements;
  - Carpet systems that meet or exceed the Carpet and Rug Institute's Green Label Indoor Air Quality Test Program;
  - Composite wood or agrifiber products containing no added urea-formaldehyde resins.
- Allow adequate time for all installed materials and furnishings to 'outgas' before the school is occupied. Assist the process by running the HVAC system continuously at the highest possible outdoor air supply setting for at least 72 hours after all materials and furnishings have been installed in order to 'flush out' the facility.
- Consider use of materials that inhibit the growth of mold.

Provide Adequate Ventilation:

- Design the ventilation system to provide a minimum of 15 cubic feet per minute per person of filtered outdoor air to all occupied spaces (consider 20 cubic feet per minute).
- Ensure that ventilation air is effectively delivered to and distributed through the school rooms.
- Provide local exhaust for restrooms, kitchens, science labs, janitor's closets, copy rooms, and vocational/ industrial shop rooms.

Prevent Unwanted Moisture Accumulation:

- Avoid ventilation air that is too moist; design the ventilation system to maintain the indoor relative humidity between 30% and 50%.
- Consider dedicated ventilation, moisture control system, distinct from the primary air-tempering system.
- Design to minimize water vapor condensation, especially within walls, on the underside of roof decks, and around pipes or ducts.
- Design to keep precipitation and ground water out of the building shell
- Assure rain water drains off the roof and away from the walls.
- Insulate all duct work and pipes to minimize potential for condensation on the exterior of these surfaces.

Operate and Maintain the Building Effectively:

- Regularly inspect and maintain the ventilation system so that it continues to operate as designed.

- Consider CO2 and/or relative humidity sensors in large assembly areas (auditorium, gym) to provide real-time monitoring of air quality.
- Design cleaning and maintenance programs to minimize the use of toxic materials.

REFERENCE STANDARDS AND GUIDELINES

ASHRAE Standard 62-2001, Ventilation for Acceptable Indoor Air Quality, Association of Heating, Refrigerating and Air Conditioning Engineers (http://www.ashrae.org/)

ASTM D 6245-1998: Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation

International Measurement and Verification Protocol, Volume II: Concepts and Practices for Improved Indoor Environmental Quality (http://smartenergy.arch.uiuc.edu/pdf/clearinghouse/IPMVPVol2.pdf)

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- American Society for Testing and Materials. ASTM D 6245-1998: Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation. Washington, DC: ASTM, 1998. (http://www.astm.org/)

- U.S. Environmental Protection Agency. Indoor Air Quality Tools for Schools and Indoor Air Quality Tools for New Schools. Washington, DC: EPA, 2002. (http://www.epa.gov/iaq/)

Online Resources

- IAQ Design Tools for Schools, U.S. Environmental Protection Agency http://www.epa.gov/iaq/schooldesign/

- National Clearinghouse for Educational Facilities. Indoor Air Quality in Schools. http://www.edfacilities.org/rl/iaq.cfm

- Washington State Dept of Health. School Indoor Air Quality Best Management Practices. http://www.doh.wa.gov/ehp/ts/IAQ/schooliaqbmp.pdf

INDOOR AIR QUALITY (IAQ) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ IAQ.1 (1 pt.) Is the site located away from any sources of outdoor pollution? If so, what measures have been taken to minimize their impact?

____

____

____

☐ ☐ ☐ IAQ.2 (1 pt.) Does the basic layout of the school keep operable windows and air intake vents away from sources of exhaust?

____

☐ ☐ ☐ IAQ.3 (1pt.) Is the HVAC system designed to minimize conditions conducive to mold/microbial growth? Describe.

____

____

____

☐ ☐ ☐ IAQ.4 (1 pt.) Does the design include individual exhaust/ventilation strategies for areas that may be sources of pollution, such as: kitchens, restrooms, science labs, chemical storage closets, dedicated copy rooms, and vocational/industrial shop rooms? Please describe briefly.

____

____

____

☐ ☐ ☐ IAQ.5 (1 pt.) Does the design include CO2 monitors for spaces with large variable, occupant loads? Please describe briefly.

____

____

☐ ☐ ☐ IAQ.6 (2 pts.) Have interior materials and products been used that are low emitters of indoor air contaminants? Please describe briefly.

____

____

☐ ☐ ☐ IAQ.7 (2 pts.) Is there a plan to 'flush out' the facility for at least 72 hours after construction and before occupancy?

____

FLEXIBILITY AND ADAPTABILITY

Courtesy of Ross Tarrant Architects, Inc.

THE WHAT AND WHY...

School facilities have always needed to adapt to change. Enrollments rise and fall; teaching and learning methods shift, and new programs emerge; the connection between the community and the school continues to evolve; and technology advances in ways that cannot be anticipated. This process shows no sign of abating. On the contrary, the pace of change in education, particularly technology-driven change, appears to be accelerating.

Creating a facility that is expected to last for more than one generation and to respond effectively to accelerating change is one of the critical challenges facing all those involved in the design, construction and renovation of schools. Responding to this challenge requires the creation of facilities that are flexible in the near term and adaptable over the long term.

A flexible facility is one that facilitates short-term rearrangements of the learning environment to suit different activities and programs. Flexibility can most easily be achieved through furnishings that are easy to move and reconfigure. The concept also extends to creating spaces that can support multiple functions, including activities by user-groups outside the school. Movable components, especially movable partitions and walls, can also be employed to enhance flexibility.

An adaptable facility is one that can accommodate more substantial and systemic change over time. Such changes may include reconfiguring spaces within a facility (not just the furnishings within those spaces); adapting/modifying spaces for substantially different uses; enlarging a facility to accommodate increased enrollment; converting one large facility into two or more 'small schools;' adapting a facility to year-round and/or 24-7 operation; and relocating or substantially reconfiguring a building's systems, especially its information technology systems.

IMPACT ON OTHER SYSTEMS

The design team needs to consider a multitude of factors to accommodate this criteria for the design of the facility. Building in flexibility for classroom spaces is particularly important. Impacts on other systems need to be understood early so that all consultants can work together toward a common goal and avoid future conflicts. HVAC, lighting and furniture systems all need to be adaptable and designed with change in mind. The building's infrastructure should also be designed so as to not preclude future facility expansion.

RECOMMENDATIONS

While flexibility and adaptability are relatively straightforward as concepts, designing a facility to accommodate them can be complicated. To the extent possible, flexibility should be accomplished with elements like furniture, fixtures, and equipment (FF&E), and specifically to items with relatively short life expectancies. History has shown that 'bricks and mortar' solutions to providing flexibility quickly become obsolete no matter how well they embody a current – but soon outdated – theory of flexible space planning.

Designing for adaptability is different and requires close attention to the size, capacity and configuration of the building's basic systems. What is the anticipated useful lifespan of the respective systems? Can the structure accommodate expansion, upward or outward? Can the MEP and IT systems be easily reconfigured to serve spaces whose size and use have changed? Can partitions be torn down or moved with minimal impacts on lighting, flooring, and/or ceiling systems?

While such considerations should not drive the design process, they should be taken into account in some way. School facilities are renovated, updated and 'adapted' all the time in a process that is complex, time consuming and often expensive. Designing for adaptability can help reduce this complexity and, hopefully, save the school time and money in the process.

Additional considerations concerning flexibility and adaptability include the following:

- To the extent possible, avoid fixed (non-movable) stations for equipment such as computers and other forms of information technology.
- Design spaces that can accommodate numerous furniture layouts.
- Design spaces that can accommodate multiple functions.
- Consider the appropriateness of raised floors in terms of both flexibility and adaptability with ever-changing technology.
- Consider the potential for subdividing the facility into two or more 'small schools.'

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Dudek, Mark. Architecture of Schools: the New Learning Environments. Boston: Architectural Press, 2000.
- Perkins, Bradford. Elementary and Secondary Schools. New York: John Wiley and Sons, 2001.

Online Resources

- Butin, D. Multipurpose Spaces. National Clearinghouse for Educational Facilities. http://www.edfacilities.org
- National Clearinghouse for Educational Facilities. Reducing the Negative Effects of Large Schools. http://www.edfacilities.org/
- Hall, M. & R. Fanning.Programming Circulation Factors in K-12 Facilities. Fanning/Howey Associates, Inc. http://www.fhai.com/
- Designshare. Planning for Flexibility, Not Obsolescence. http://www.designshare.com/research/EEK/Ehrenkrantz1.htm.
- Designshare. How Large Should a School Be? http://www.designshare.com/index.php/home

FLEXIBILITY AND ADAPTABILITY (FA) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ FA.1 (1 pt.)Do spaces facilitate short-term reconfigurations of the learning environment to suit different activities and programs? Are spaces being designed so they can accommodate numerous furniture layouts? Please describe briefly.

____

____

____

☐ ☐ ☐ FA.2 (1 pt.) Has the school been designed to accommodate potential future changes - for example, response to changes in grade structure, curriculum, community use, student population, etc.? Please describe briefly.

____

____

____

☐ ☐ ☐ FA.3 (1 pt.) Will the design allow the school to adapt to year-round and/or 24-7 hour operation? Please describe briefly.

____

____

____

☐ ☐ ☐ FA.4 (1 pt.) Are the lighting and IT systems configured to allow for maximum flexibility in room utilization, especially in the classrooms? Describe.

____

____

____

☐ ☐ ☐ FA.5 (1 pt.) Do the electrical, IT, telecom, and security systems have sufficient excess capacity to expand and change over time?

____

SAFE & ACCESSIBLE

SAFETY AND SECURITY

THE WHAT AND WHY...

Safety and security have become critical concerns for students, teachers, and parents across the country. A Green and Healthy school should create a safe and secure environment by design. Opportunities for natural surveillance should be optimized, a sense of territoriality should be reinforced, access should be controlled, and technology should be used to complement and enhance, rather than substitute for, a facility's security-focused design features.

Crime and vandalism – and the fear they foster – are problems facing school populations throughout the United States. While better buildings cannot solve these problems alone, they can be powerful factors in helping reduce crime and other antisocial behavior. Thoughtful design that builds on Crime Prevention through Environmental Design (CPTED) principles is crucial to this process.

IMPACT ON OTHER SYSTEMS

The influence of safety and security considerations can have an impact on the overall design and layout of the building. In particular, the layout will be affected with attention to good visibility and ease of monitoring student activities in the building. Interior glazing for visibility can also assist sharing of natural light into interior building spaces. The building security system may be integrated with other IT systems.

RECOMMENDATIONS

Control Access to the Building and the Ground:

- Consider decorative fencing to control access to school grounds.
- Limit the number of entries to the building.
- Allow visual surveillance of all entries from inside the school.
- Provide the ability to 'lock down' parts of the school when the facility is used for after-hours activities.

Integrate Security Technology:

- Consider incorporating interior and exterior surveillance cameras.
- Ensure that all high-risk areas (office, cafeteria, shops, labs, etc.) are protected by high security locks.
- Consider metal detectors and other security technologies, as appropriate.

Increase Opportunities for Natural Surveillance:

- Design landscaping to minimize places that are hidden from view.
- Ensure that key areas – parking, bicycle storage, drop-off points, play equipment, entries – are easily observable from inside the building.
- Design exterior lighting to facilitate nighttime surveillance. Consider motion sensor lighting for energy efficiency.
- Consider providing views (using glazed doors or windows) from classrooms into circulation corridors.

- Design to minimize areas within the building that are hidden from view.

Reinforce a Sense of Territoriality:
- Foster a sense of 'ownership' of the school by students and teachers.
- Clearly define borders – what is part of the school and what is not.
- Consider decorative fencing and special paving treatments to delineate the boundaries of the school grounds.
- Consider designing common areas – particularly corridors – that are less institutional and more 'room like.'
- Consider materials and finishes that are graffiti resistant.

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- The Aegis Protection Group, Inc. The Complete School Safety and Security Manual. Goshen, KN: ACPI, 2001. (http://www.aegisprotect.com/acpi/school%20manual.htm)

- Crowe, Timothy D. Crime Prevention through Environmental Design. Boston: Butterworth-Heinemann, January 2000. (http://books.elsevier.com)

- National Crime Prevention Council. Designing Safer Communities: A CPTED Handbook. Washington, DC: NCPC, 1997 (http://www.ncpc.org/publications/Home_and_Neighborhood.php)

- National Crime Prevention Council. Designing Safe Spaces: Involving children and youth in Crime Prevention Through Environmental Design. Washington, DC: NCPC, 2005 (http://www.ncpc.org/publications/Home_and_Neighborhood.php)

- Newman, Oscar. Defensible Space. New York: Macmillan, 1972. (http://www.defensiblespace.com/book.htm)

Online Resources

- American Society of Industrial Security. http://www.asisonline.org/

- FEMA 428. Primer to Design Safe School Projects in Case of Terrorist Attacks. http://www.fema.gov/library/viewRecord.do?id=1561

- Keep Schools Safe. http://www.keepschoolssafe.org/

- National Resource Center for Safe Schools. http://www.safetyzone.org/

- School Safety, National Crime Prevention Council. http://www.ncpc.org/Topics/School_Safety/index.php

SAFETY AND SECURITY (SS) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ SS.1 (1 pt.) Have areas of the building been designated for use as a community emergency shelter? Please describe briefly.

____

____

____

☐ ☐ ☐ SS.2 (1 pt.) Have appropriate shelter spaces been designated? Please describe briefly.

____

____

____

☐ ☐ ☐ SS.3 (1 pt.) Has the site been studied to find where potential safety and security risks come from, i.e. high traffic corridors, environmental hazards or brown fields, etc? How have potential risks been addressed?

____

____

____

☐ ☐ ☐ SS.4 (1 pt.) Have access/egress points been reviewed on the basis of lockdown and evacuation? Please describe briefly.

____

____

____

☐ ☐ ☐ SS.5 (1 pt.)Have opportunities for natural surveillance and access control been 'designed in?' If so, please describe briefly.

____

____

____

ACCESSIBILITY

THE WHAT AND WHY...

Several decades of regulations have firmly established the concept of 'free and appropriate education for all students with disabilities in the least restrictive environment' in the public consciousness. Laws such as the Individuals with Disabilities Education Act (IDEA) have further reinforced inclusive education for children with disabilities as both a philosophical imperative and a legal right.

The principle of inclusive education maintains that children with disabilities should, to every extent possible, be educated in the same schools as, and along side of, their peers who are not disabled. Successful inclusive education depends upon several mutually reinforcing structures: a strong philosophical commitment, creative and appropriate teaching strategies, dedicated and effectively trained personnel, and a school facility that provides the proper environmental supports for students and their curricula.

As inclusive education and 'mainstreaming' programs are enacted across the U.S., increasing numbers of children with disabilities, who were historically educated in special schools, are now being integrated into regular school systems. Since this trend will continue, schools that are currently being constructed will educate a continually expanding population of students with special needs. Because disability among school age children is both prevalent and highly diverse, providing an inclusive school environment for these students offers unique opportunities and challenges to planners, architects, administrators, and teachers.

A particular challenge is creating environments that support students with cognitive – as opposed to physical – disabilities. While the ADA, through its guidelines and standards, has provided guidance on designing to accommodate those with physical, especially orthopedic, disabilities, relatively little is known about designing to accommodate students with cognitive disabilities such as attention deficit disorder or autism. Unfortunately, the majority of special needs students in or entering the public school system appears to suffer from cognitive rather than physical disabilities. A report by the National Research Council indicates that of the five million K-12 students nationwide with disabilities that require special education, "more than 90 percent fall into one of just four categories of disability: speech or language impairment, serious emotional disturbance, mental retardation, and specific learning disability" and that "specific learning disabilities account for more than half of all eligible students" (McDonnell, McLaughlin, and Morison, 1997).

While students with physical disabilities must still be accommodated, it is becoming clear that School Facilities Projects must also address students with other forms of disability: learning deficits, sensory impairments, intellectual limitations, emotional problems, and/or some combination of all of the above. Designing a school environment that meets these highly diverse needs, as well as the needs of the teachers and 'typical' students, presents significant challenges.

IMPACT ON OTHER SYSTEMS

Accessible and inclusive design reinforces the objectives of a number of other Green and Healthy Schools criteria:

- Controlling glare impacts the lighting, daylighting strategies, and visual comfort that may impact energy performance.
- Controlling noise interacts directly with designing for acoustic comfort.
- Designing to prevent uncontrolled egress from the school impacts security design.
- Planning classrooms to accommodate students with disabilities impacts learning centered design, flexibility and adaptability, and information technology configurations

RECOMMENDATIONS

- Involve special education specialists and school health care personnel at all stages of the design process.
- Provide variety in the classroom environment.
  - Consider strategies – alcoves, small adjacent rooms - to provide visual and acoustical separation between activities to reduce distractions.
  - Consider the need to accommodate, at various times, teachers plus other adults (special teachers, personal aides, et al.) in the space.
  - Consider varied ceiling heights as a way to create variation and define more intimate, "time out" areas.
  - Consider designing areas in the hallway that can be used for "time out" areas and individual consultations.
- Integrate accessible areas into the facility.
  - Avoid separate "accessible" labs, project rooms, etc. Instead, integrate accessible workstations into these rooms.
  - Avoid isolating accessible seating in auditoriums, cafeterias, libraries, etc. Instead, spread/integrate such seating throughout these rooms.
- Provide for expanded services in the health suite.
  - Consider providing larger spaces.
  - Consider the need for a lift.
  - Consider the need for a private examination room or area.
  - Consider providing a one-way mirror in examination or therapy rooms.
  - Consider providing a separate physical therapy and/or occupational therapy suite.
- Minimize travel distances.
  - Locate key services – food services, bathrooms, and, especially, elevators – centrally
- Integrate special needs and general education.

ACCESSIBILITY

  - Avoid clustering special education spaces in one location. Spread them throughout the facility.
  - Within the classroom, avoid clustering services – electric outlets, data ports – in special areas or solely along the perimeter of the room. Attempt to provide as many access points as possible across the room.
- Consider how parents of special needs students will use the facility.
  - Consider one or more rooms or areas parents can use.
  - Consider special parking areas for visiting parents.
- Outdoors
  - Consider how the outdoor play areas (pathways, playground surfaces, etc.) can be designed to accommodate students with a variety of disabilities.
  - Consider how outdoor learning environments can be designed so that students with disabilities can access and participate in these environments.
- Furnishings
  - Consider furniture with rounded edges.
  - Ensure that desks and tables are accessible to students in wheelchairs (no aprons or legs that block access).
  - Provide height-adjustable desks and chairs.
  - Provide accessible lockers at the end of locker rows.
- Bathrooms/Toilets
  - Consider placing toilets near classrooms.
  - Ensure some or all toilets have accessible stalls. (If only some, then make sure they are centrally located.)
  - Consider accessible stalls with sinks in them, so that students with special toileting needs can use the equipment in private.
- Pay special attention to glare. Design lighting and surfaces to reduce glare as much as possible.
- Revisit building security considerations from the perspective of keeping students with certain disabilities safely within the facility.

REFERENCE STANDARDS AND GUIDELINES

Individuals with Disabilities Education Act .
http://www.ed.gov/offices/OSERS/Policy/IDEA/index.html

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Bar, Laurel & Galluzzo Dreyfuss. The Accessible School Universal Design for Educational Environments: Universal Design for Educational Settings. Berkeley: MIG Communications, 1999.

- North Carolina State Department of Public Instruction, Raleigh Division of School Support. Exceptional Children Facilities Planner; Sample Plans, Accessibility Guidelines. Raleigh, NC: School clearinghouse, Jun 1998. http://www.schoolclearinghouse.org/pubs/exchild.pdf

Online Resources

- Americans with Disabilities Act (ADA) Home Page. http://www.ada.gov/.

- National Clearinghouse for Educational Facilities.
  - Creating Accessible Schools
  - Planning and Designing for Students with Disabilities. http://www.edfacilities.org/pubs/disabilities.pdf

- Council of Educational Facility Planners International (CEFPI). www.cefpi.org/.

- Universal Design, http://www.ed.gov/about/offices/list/ovae/pi/AdultEd/disaccess.html

- Stoecklin, Vicki L. Designing for All Children. 1999 White Hutchinson Leisure & Learning Group. http://www.whitehutchinson.com/children/articles/designforall.shtml.

- Universal Design Education Online. http://www.udeducation.org

ACCESSIBILITY (A) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ A.1 (1 pt.) Are measures being used to ensure the facility is friendly to physically and cognitively disabled students? Please describe briefly.

____

____

☐ ☐ ☐ A.2 (1 pt.) Do instruction spaces offer a variety of subspaces that are visually and acoustically distinct, and can instructional spaces accommodate a teacher plus other adults (special teachers, personal aides, etc.), if necessary? Please describe briefly.

____

____

☐ ☐ ☐ A.3 (1 pt.) Are key spaces accessible to all students without having to unnecessarily separate students with disabilities from the rest of the student body (i.e. cafeteria, auditorium, libraries, etc.) ? Are accessible areas integrated well into each space, i.e. accessible spaces and seating areas are not separated from the rest. Please describe briefly.

____

____

☐ ☐ ☐ A.4 (1 pt.) Have outdoor spaces been designed to accommodate the various needs of students with special needs? Please describe briefly.

____

____

☐ ☐ ☐ A.5 (1 pt.) Do furnishings, fixtures, and equipment (FF&E) accommodate students with physical and/or cognitive disabilities (e.g. tables with rounded edges and corners, height-adjustable desks, lockers at the end of locker rows, etc.)? Please describe briefly.

____

____

LEARNING CENTERED DESIGN

THE WHAT AND WHY...

As society transitions from the industrial to the information age (and beyond), our understanding of the learning process continues to evolve. Educational strategies and the facilities within which these strategies are implemented are also evolving. A key aspect of this evolution is that the facility is no longer viewed as merely a passive shell for the delivery of education. Rather, the facility is increasingly seen as an active variable in the educational process – one that can, if properly designed, assist and inspire learning.

While there does not appear to be one key trend – or family of trends – dominating this educational evolution, several developments are emerging which should be taken into account when designing K-12 schools:

Learning-Centered Environments

Student needs are a primary focus for the educational process and should be reflected in the design of the learning environment. Education is evolving from a 'teacher as leader' to a 'teacher as coach' model.

The facility as a tool to deliver Core Content

One of the Kentucky Academic Expectations states "students identify and analyze systems".

Multiple Teaching and Learning Styles

Multiple forms of intelligence – and multiple ways and speeds of learning – exist within any student body. A School Facilities Project should strive to accommodate the needs of all learners. This includes the need for individualized instruction, self-directed learning, collaborative learning, and activity-based/project-based learning.

Variety

Learning can and does occur in a wide variety of settings. A School Facilities Project should incorporate a range of different spaces and 'places,' including formal and informal gathering and instructional areas. To the extent feasible, spaces should be able to be reconfigured to accommodate multiple types of learning activities.

Personalization

Personalization of space is an important factor in any individual's development. A School Facilities Project should help foster such personalization by students and teachers. To the extent possible, a design should also foster a personal sense of ownership/ stewardship of the facility and its many 'places' among students and teachers.

Link to Outdoors

A strong connection to the outdoors can have beneficial impacts on both students and teachers. A School Facilities Project should facilitate such connections. In addition, outdoor elements, including roofs, should be designed to optimize their potential use as learning environments. A school should incorporate as many such 'outdoor learning environments' as possible.

IMPACT ON OTHER SYSTEMS

Planning an educational facility to accommodate multiple forms of learning requires coordination with many systems in the building. Classrooms designed to accommodate students working in small groups or individuals working at their own pace will need lighting and HVAC systems that are equally flexible. If areas such as the roof, present the opportunity to be used for curricular purposes, then the location of mechanical equipment, exhaust vents, skylights, and the like should be carefully coordinated to optimize the available space.

RECOMMENDATIONS

Attempting to design facilities within a constantly evolving educational environment can be tricky at best. The following should therefore be treated as preliminary considerations that should inform, but not drive, the design process. Special attention should be paid to the role that stakeholders can play in defining their particular educational objectives and needs - perhaps the most straightforward way to design user-responsive, learning-centered facilities.

Include teachers, administrators, and students early and continuously in the planning and design process. Attempt to learn the approaches to teaching and learning currently being practiced, and any new directions the school intends to pursue in the future. To the extent feasible, develop a program that is responsive to – and a design that accommodates - this input.

Use the building to help deliver academic standards.

- Consult with lead teachers in the core content and Proram of Studies for suggestions and ideas.
- Design interactive opportunities for the students to learn using the building structure. Consider the facility itself can be used as a '3-D textbook.'

The school building and grounds is rich with systems. Find ways to expose them and help teachers and students identify them, from the mechanical, electrical and ventilation systems, to the biospheres on the property.

- Make building systems visibly and physically accessible. This may include exposed pipes, system monitors, embedded graphics or signage.
- Provide feedback (including real time data) so students can see and measure the impact of their actions on building operations.

- Provide students with a connection to the natural environment
- Document sustainable features.

Consider the school grounds – pathways, play structure areas, gardens, sandy spaces, aquatic areas, seating areas, ball fields, dramatic play areas, wooded areas, covered pavilions or porches and, as appropriate, the roof – as potential "outdoor learning environments" and design them as such. Insure accessibility to these areas for all students.

REFERENCE STANDARDS AND GUIDELINES

Poudre School District 2005 DRAFT Sustainable Design Guidelines pp.3-45-3-49.
http://www.psk.k12.co.us/services/operations/planningdesign/resources.aspx
REBUILD COLORADO - SUCCESS STORY - POUDRE SCHOOL DISTRICT

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Iltus, Selim & Renee Steinhagen. Where Do Children Play? The Importance and Design of Schoolyards. Newark, NJ: New Jersey Appleseed Public Interest Law Center, 2003. (http://www.njappleseed.org/)

- Chan, Dr. Tak-Cheung & Petrie, Dr. Garth. A Well Designed School Environment Facilitates Brain Learning. Scottsdale, AZ: Council for Educational Facility Planners, 2000. (http://www.cefpi.org/) V35-3.

Online Resources

- National Clearinghouse for Educational Facilities:
  - Do School Facilities Affect Academic Outcomes?
  - Ten Educational Trends Shaping School Planning and Design
  - Teacher Workspaces
  - Student Commons
  - Planning School Grounds for Outdoor Learning Classrooms
    http://www.edfacilities.org/. (1 Aug, 2004)

LEARNING CENTERED DESIGN (LCD) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ LCD.1 (1 pt.) Were consultations with teachers, administrators, staff, and students scheduled throughout the design of the building to insure the building and grounds support best instructional practices? Please list number and dates of consultations and the categories of people who attended, e.g. science teachers, classroom teachers, ad ministration, etc.

____

____

☐ ☐ ☐ LCD.2 (1 pt.) Does the space used for teaching and learning provide opportunities for both individualized and group instruction? Can furniture be reconfigured to accommodate work areas of different sizes and types? Please provide two examples of how this was done.

____

____

____

☐ ☐ ☐ LCD.3 (1 pt.) Do students and teachers have unique places to work and gather (desks, meeting areas, etc.) that provide a feeling of ownership and, therefore, stewardship of the building? For example, do teachers have places where they can meet to do group planning? Please describe briefly.

____

____

☐ ☐ ☐ LCD.4 (1 pt.) Is the facility treated as a "3-D Textbook" in that building systems are visibly and physically accessible ? Are sustainable features documented with signage or other graphics? Please document at least three examples of this 3-D Textbook design.

____

____

____

☐ ☐ ☐ LCD.5 (1 pt.) Are spaces designed for instruction to support inquiry-based learning? For example, do students have access to materials needed for experiments, including water, work space, cleaning supplies, and equipment storage? Are resources such as Internet access and reference books easily accessible? Please describe briefly.

____

____

INFORMATION TECHNOLOGY

THE WHAT AND WHY…

There is no question that technology is transforming education at all levels in the United States. A simple statistic indicates the recent, explosive growth in information technology in schools: in 1998 the ratio of public school students to instructional computers with internet access was 12.1 to 1; in 2002 the same ratio was 4.8 to 1. (From the National Center for Education Statistics report, "Internet Access in U.S. Public Schools and Classrooms: 1994-2002.") The technology revolution that has transformed business and industry in the U.S. is clearly impacting education as well.

What this means for the educational process is still emerging. It is clear that technology is beginning, and will continue, to impact K-12 curricula and instructional methods in significant and unpredictable ways. It is also clear that, whatever technologies emerge over time and however they may impact the curriculum or instructional methods, they will become outdated and replaced far more quickly than the facility that houses them.

IMPACT ON OTHER SYSTEMS

Technology design interacts with, and impacts, other systems in a facility in two distinct ways. Technology infrastructure, especially low voltage cabling, interacts with other basic infrastructure systems (wiring, plumbing, HVAC, and building structure). Technology applications (projection areas, computer screens, white boards) interact strongly with lighting and daylighting systems. Technology configurations and layouts should acknowledge the lighting/daylighting design in a space. The lighting/daylighting design strategy should consider the types of technology to be used in the space. The plug loads, heating loads of technology, and equipment should be considered in the thermal and energy analyses conducted for a space and for the facility as a whole. Special attention should be paid to potential changes (and increases) in plug and heating loads over time as more and different forms of technology (especially more computers) are added.

RECOMMENDATIONS

Designing educational facilities to accommodate rapidly evolving technologies is complicated and challenging, requiring close cooperation between designers, technology consultants and district personnel. The following general issues should be considered as the detailed technology plan for a facility is developed.

- Consider whether/how a school's technology plan facilitates interaction/integration with other schools in the district and with the district's overall technology plan.

INFORMATION TECHNOLOGY

- Consider the impacts of multiple forms of technology (white boards, projectors and projection surfaces, 'wired' furnishings, etc.) not only computers and telecom.
- Consider the potential for 1-to-1 computing (one computer for every learner, if only on an intermittent basis) to become a reality in the near future.
- Provide 'technology-enabled' infrastructure to support both wired and wireless applications. Configure the infrastructure to meet current demands, but 'design in' the capacity to easily reconfigure the infrastructure to meet future needs.
- Design to integrate technology throughout a school, rather than in isolated pockets.
- Design learning environments that facilitate cooperation between technology and instruction. Avoid letting technology considerations dominate a learning environment design strategy.
- Consider the impact of technology on other building systems such as lighting and HVAC.

REFERENCE STANDARDS AND GUIDELINES

- Energy Star Program, Energy Star Qualified Products.
  http://www.energystar.gov/index.cfm?fuseaction=find_a_product

INDUSTRY AND GOVERNMENTAL RESOURCES

Online Resources

- Designshare. Planning for Flexibility, Not Obsolescence.
  http://www.designshare.com/research/EEK/Ehrenkrantz1.htm.

- National Clearinghouse for Educational Facilities:
  - Wireless Wide Area Networks for School Districts
  - The Role of Wireless Computing Technology in the Design of Schools
    www.edfacilities.org.

- Energy Star
  http://www.energystar.gov

INFORMATION TECHNOLOGY (IT) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ IT.1 (1 pt.) Do the locations of projection equipment, whiteboards, monitors, etc. work well with the lighting/daylighting and heating/cooling strategies? Please explain briefly.

____

____

☐ ☐ ☐ IT.2 (1 pt.) Have the information technology systems been accommodated and/or integrated with building systems? (for example, HVAC, electrical, fire alarm, security etc.) Please explain briefly.

____

____

☐ ☐ ☐ IT.3 (1 pt.) Have the information technology systems been accommodated and/or/ integrated such that building performance metrics are readily available to its occupants? Please explain briefly.

____

____

☐ ☐ ☐ IT.4 (1 pt.) Are specific strategies/procedures defined to train occupants on how to access building performance metrics? Please explain briefly.

____

____

☐ ☐ ☐ IT.5 (1 pt.) Were the plug loads and/or heating loads of technology and equipment considered in the thermal and energy analyses for the facility?

____

OUTDOOR LEARNING AREAS

THE WHAT AND WHY...

There is little doubt that school boards, architects, contractors and teachers would find it ludicrous to build a beautiful new school and then close off half of it before students ever arrive. Not only would it be a waste of money, but also students and teachers would miss the many learning opportunities afforded by those lost facilities. Yet, this exact scenario is played out when a new or remodeled school does not take advantage of its outdoor areas as learning tools for students. The section below helps school planners, school boards, teachers and parents better understand how outdoor learning sites can enhance learning opportunities for children.

Numerous learning goals in the Academic Expectations, Core Content for Assessment and the Program of Studies focus on the living and nonliving systems that support us and the creatures around us. Often the very best way to study these systems is to see them in action. For example, as any gardener will tell you, the best way to study how plants grow is to watch them grow - literally making food, fiber, shade and shelter out of sunlight, seeds, water and soil. While the sun provides energy to make plants grow, it also provides energy (usually indirectly) to keep us warm and cool and performs many other functions that we need to live, thrive and learn. Plans for using these special learning areas are best made as a building or renovation is being planned. This makes use of the outdoor space more effective, easier to access for learning and saves costs in the end.

IMPACT ON OTHER SYSTEMS

Outdoor learning areas often use native species and habitat areas as learning tools. This impacts landscape design, which in turn can impact HVAC, acoustic comfort and lighting. Planting deciduous trees can lower energy bills in both hot and cold weather, as can windbreaks. Water catchment features can be used to irrigate gardens or create wetlands, also important features in many outdoor learning areas. Using Best Management Practices when planning paved surfaces can significantly impact water quality and erosion on the school site.

RECOMMENDATIONS

Listed below are several features that are essential to make optimal use of outdoor learning areas. Below that are lists of additional, though optional, features that further enhance these areas.

- At least 5% of the school site should be devoted to the outdoor learning area. An ideal outdoor learning area is at least one half acre.

- The area devoted to outdoor learning should have topsoil (suitable for growing plants) at least five inches deep.
- A portion of the area devoted to outdoor learning should have direct sunlight at least six hours a day.
- The area devoted to outdoor learning should have access to a water source (e.g. hose, pond or cistern) that can be used for watering plants, cleaning tools, running experiments, etc. This source should be within fifty feet of the site. (Note: If using a natural water source, make sure it is tested regularly for safety.)
- The area devoted to outdoor learning should be in a safe location away from traffic, construction or other hazards. A quiet area is also helpful, where this is possible.
- The area devoted to outdoor learning should have a location (preferably shaded) where students can sit and write or work in groups.

The following features are wonderful additions to outdoor learning areas once the basics (listed above) are in place. For more specific information on building these features and using them for instruction, go to http://keec.ky.gov/outdoorareas.htm

Wildlife Habitat
Weather Station
Birds/Bird Blinds
Wetlands
Rocks and Geology
Soils
Historical features
Walking Trails
Native Plant Gardens
Greenhouses
Space and Sky
Butterfly Gardens
Water and Wastewater Study

REFERENCE STANDARDS AND GUIDELINES

Jefferson County Public Schools Schoolyard Habitat Guide
http://www.jefferson.k12.ky.us/Departments/EnvironmentalEd/SchoolyardHabGd/schoolydhabgd.html

Kentucky Environmental Education Council Publication: A Guide to Creating, Using and Maintaining Outdoor Classrooms http://keec.ky.gov/

Kentucky Environmental Education Council Publication: Developing Outdoor Learning Areas: A Kentucky Guide http://keec.ky.gov/outdoorareas.htm

Online Resources

Grounds for Learning by Cheryl Corson in Learning by Design: A School Leaders Guide to Architectural Services. http://www.asbj.com/lbd/2003/grounds.html

Schoolyard Habitat from the National Wildlife Federation http://www.nwf.org/backyardwildlifehabitat/creatinghabitatsites.cfm

Information and grants for Outdoor learning areas from the Lowe's Company or http://www.lowes.com/lowes/lkn?action=pg&p=AboutLowes/outdoor/apply1.html

The Jefferson County Public Schools Website resources on Outdoor Classrooms
http://www.jefferson.k12.ky.us/Departments/EnvironmentalEd/outclass.html
http://www.jefferson.k12.ky.us/Departments/EnvironmentalEd/SchoolyardHabGd/section1.html#Anchor-Outdoor-49575

Ideas for studying the weather from the National Oceanic and Atmospheric Administration
http://www.weather.gov/om/edures2.htm ; http://www.weather.gov/om/edures.shtml

Ideas for feeding and watching birds at
http://www.audubon.org

Website designed by a teacher on how to develop a butterfly garden
http://udel.edu/%7Elynneb/butterfly/

Information from the Smithsonian Butterfly Garden
http://www.amnh.org/exhibitions/butterflies/garden.html

Natural Resources Conservation Service publication on wetlands
http://www.nrcs.usda.gov/feature/backyard/bakwet.html

Integrated pest management specifically for outdoor classrooms from the University of Kentucky
http://www.uky.edu/Ag/IPM/teachers/outdoorclassrm/odc.html

Information on soils and soil profiles
http://www.liverpool.k12.ny.us/standards/lstandards/curriculum/sci/g3sci/soillayers.html

Learn about composting from the Kentucky Division of Waste Management
http://www.waste.ky.gov/factsheets/

OUTDOOR LEARNING AREAS (OLA) – CRITERIA CHECKLIST

Yes	No	N/A	
☐	☐	☐	OLA.1 (1 pt.) Is at least 5% of the school site devoted to the outdoor learning area? An ideal outdoor learning area is at least one half acre. Provide map of site.
☐	☐	☐	OLA.2 (1 pt.) The area devoted to outdoor learning should have topsoil (suitable for growing plants) at least five inches deep and a portion of the area devoted to outdoor learning should have direct sunlight at least six hours a day. Please provide a map of the site including the outdoor learning area.
☐	☐	☐	OLA.3 (1 pt.) The area devoted to outdoor learning should have access to a water source (e.g. hose, pond or cistern) that can be used for watering plants, cleaning tools, running experiments, etc. This source should be within fifty feet of the site. (Note: If using a natural water source, make sure it is tested regularly for safety. Please describe your water access.
☐	☐	☐	OLA.4 (1 pt.) The area devoted to outdoor learning should be in a safe location away from traffic, construction excessive sun or other hazards. A quiet area is also helpful, where this is possible. Please describe.

APPENDIX

SUBMISSION INSTRUCTIONS

Any Kentucky school receiving certification through the U.S. Green Buildings Council's Leadership in Energy and Environmental Design (LEED) is automatically recognized as a Kentucky Green and Healthy School. In addition, schools not applying for LEED certification may also be recognized by completing the Kentucky Green and Healthy Schools Design Manual.

To be recognized as a New Kentucky Green & Healthy School, schools must meet all prerequisites and achieve a minimum score of 90 (out of 133) in the design criteria checklists. Any school scoring at our above this minimum is awarded the New Kentucky Green & Healthy School flag. To be considered for this recognition follow these steps:

Step 1: Have engineers, architects and other design professionals complete the criteria checklists.

Step 2: If your school meets all prerequisites and achieves a minimum score of 90, mail the completed checklists to:

Kentucky Environmental Education Council
500 Mero St., CPT - Room 2107
Frankfort, KY 40601

Step 3: A panel of architects and engineers will review your completed checklists

BUILDING SHELL (BS) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ BS.1 (Prerequisite) Does the building shell exceed the requirements of the latest edition of the IECC by 10% or more in effective thermal performance? What is the composite U-value (including boundary layers) of a typical:

Roof Assembly __________

Wall Assembly __________

Window Assembly _______

☐ ☐ ☐ BS.1.1 (8 pts.) For each 5 per cent increment beyond the level in BS.1, credit 1 additional point up to a maximum of 8 points. Provide COMcheck or other computer models summary showing percentage improvements.

____

☐ ☐ ☐ BS.2 (1 pt.) Does the building design group the functions that may need less glazing (auditoriums, kitchens, etc?) on the east and west, and those that will benefit most from daylight (classrooms, corridors, etc.) on the north and south? Describe.

____

____

____

☐ ☐ ☐ BS.3 (1 pt.) Were light-colored surfaces used as a means of reducing heat gain? Describe.

____

____

____

☐ ☐ ☐ BS.4 (1 pt.) Are landscaping and/or exterior shading devices being used to reduce heat gain on the building envelope? Describe.

____

____

☐ ☐ ☐ BS.5 (1 pt.) Does the design for the building envelope performance include features to prevent: thermal bridging, moisture transfer, air infiltration, water intrusion, etc.? Describe each briefly.

____

____

☐ ☐ ☐ BS.6 (1 pt.) Was perimeter foundation insulation installed?

____

HVAC – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ HVAC.1 (Prerequisite) Does the equipment specified exceed the requirements of the Kentucky Building Code by at least 10 percent? Submit COMcheck summary page.

☐ ☐ ☐ HVAC.2 (1 pt.) Has the HVAC system been selected to meet the maximum energy usage requirements of the 'Energy Analysis' section? Describe the type of HVAC system that has been selected.

☐ ☐ ☐ HVAC.3 (1 pt.) Was the HVAC system selected from a life cycle cost basis considering HVAC system first cost, annual energy cost, annual maintenance cost and future equipment replacement cost? If so, please describe briefly the analysis:

☐ ☐ ☐ HVAC.4 (1 pt.) Has the HVAC equipment been 'properly sized' to meet predicted demand? What tool was used to size the equipment?

☐ ☐ ☐ HVAC.5 (1 pt.) Is the HVAC control system capable of being controlled from one central location? Describe the system and also discuss its capabilities with regards to web access, system performance verification, individual classroom control and interaction with other non-HVAC systems.

☐ ☐ ☐ HVAC.6 (1 pt.) Is the entire system configured to minimize operation, maintenance and repair loss? If so, describe briefly.

☐ ☐ ☐ HVAC.7 (1 pt.) Is heat recovery provided for the ventilation system? If so, please describe briefly.

DAYLIGHTING (DL) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ DL.1 (5 pts.) Does daylighting provide at least 60 percent of the required light levels for at least 50 percent of the continually occupied instructional space? What daylighting strategies have been used particularly in the classrooms? Please describe briefly.

____

____

____

☐ ☐ ☐ DL.2 (1 pt.) How have siting and site elements influenced the building's access to sunlight? Is the building oriented to maximize day lighting potential? Please describe briefly.

____

____

____

☐ ☐ ☐ DL.3 (1 pt.) Have specific strategies been used (for windows, clerestories, skylights and/or roof monitors) to control unwanted heat gain and glare? If so, please describe briefly.

____

____

____

☐ ☐ ☐ DL.4 (1 pt.) Do the daylighting and electric lighting systems interact to lower energy use over time? Please describe briefly.

____

____

____

☐ ☐ ☐ DL.5 (1 pt.) Have outside views been incorporated to benefit as many users as possible? Please describe briefly.

____

____

____

ELECTRIC LIGHTING (EL) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ EL.1 (Prerequisite) Does the building 'watts per square foot' lighting level exceed the Kentucky Building Code requirements by at least 5 percent-? Define final watts/ft2 number, and attach COMCheck submittal form.

____

☐ ☐ ☐ EL.2 (1 pt.) Are lighting strategies for each type of space in the facility going to be distinct from each other based on the function and necessary light levels? Please describe briefly.

____

____

____

☐ ☐ ☐ EL.3 (1 pt.) Will individual teachers have control over the lighting conditions of their classrooms? Please describe briefly.

____

____

____

☐ ☐ ☐ EL.4 (1 pt.) Have controls been specified that will help save energy and operating costs? Please describe briefly.

____

____

____

☐ ☐ ☐ EL.5 (1 pt.) Are there plans to train the building owner on the lighting control system? Please describe briefly.

____

____

____

☐ ☐ ☐ EL.6 (1 pt.) Is optimizing the interaction between the electric lighting system and potential day lighting strategies part of the integrated design? Please describe briefly.

____

____

____

ENERGY ANALYSIS (EA) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ EA.1 (Prerequisite) Has the building been designed to improve the energy usage goals in the Kentucky Building Code by at least 10 percent?

____

☐ ☐ ☐ EA.2 (1 pt.) Has an energy analysis tool been used on this project to predict energy consumption? What tool has been used, and what types of analyses were performed?

____

____

☐ ☐ ☐ EA.3 (1 pt.) Have innovative systems been used to meet the building energy goal such as a highly efficient building shell, low energy lighting systems, geothermal system, variable air/water flow systems, heat recovery systems, etc. If yes, describe innovative systems:

____

____

☐ ☐ ☐ EA.4 (5 pts.) Has the building been designed to be Energy Star compliant with respect to annual energy usage? If yes, what is the maximum annual KBTU's/per square foot allowed by Energy Star and the projected actual KBTU's/per square foot:

____

____

☐ ☐ ☐ EA.5 (1 pt.) Is the building designed so that measurement and verification of the energy usage can be accomplished? Please describe briefly.

____

____

____

COMMISSIONING (C) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ C.1 (5 pts.) Is commissioning being used for HVAC system and building envelope? Please describe briefly.

☐ ☐ ☐ C1.1 (1 pt.) Add 1 additional point for commissioning 3 or more of the following: lighting, plumbing, IT, power distribution, alarm systems (fire, security, intrusion). Submit description of additional systems being commissioned and how commissioning is being accomplished.

☐ ☐ ☐ C.2 (1 pt.) At what stage of the design process was the commissioning agent engaged? If commissioning is being performed, has the commissioning agent been brought onboard during the design phase prior to bidding? Describe design phase commissioning.

☐ ☐ ☐ C.3 (1 pt.) Please describe briefly the key elements of the commissioning plan.

☐ ☐ ☐ C.4 (1 pt.) Were the functional performance of key systems tested and verified?

☐ ☐ ☐ C.5 (1 pt.) Are the results documented in a commissioning report?

ENVIRONMENTALLY RESPONSIVE SITE PLANNING (SP) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ SP.1 (1 pt.) Have provisions been made for good pedestrian, mass transit, and/or bicycle access? Have safe routes to the school been identified? Please describe briefly.

____

____

____

☐ ☐ ☐ SP.2 (1 pt.) Are there areas of the site and/or the surrounding community that could be used as 'outdoor laboratories' for teaching? Please describe briefly.

____

____

☐ ☐ ☐ SP.3 (1 pt.) Does the design preserve and/or restore existing natural areas of the site? Does the design help control storm water runoff with various measures such as pervious paving, storm water retention features and strategic landscaping? Briefly describe.

____

____

____

☐ ☐ ☐ SP.4 (1 pt.) Is environmental landscaping (xeroscaping, indigenous and low-irrigation vegetation) integrated into the site design to reduce the need for costly maintenance of grass lawns? Please describe briefly.

____

____

____

☐ ☐ ☐ SP.5 (1 pt.) Is the building, particularly the classroom wings, oriented in a predominantly east-west direction with daylighting glazing facing north and/or south to facilitate access to day light? Please describe briefly.

____

____

____

☐ ☐ ☐ SP.6 (1 pt.) Have landscaping strategies, particularly tree planting been used to enhance the building's high performance features (i.e. by providing shade where it's needed but not blocking sunlight that's used for day lighting)? Please describe briefly.

____

____

WATER EFFICIENCY (WE) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ WE.1 (1 pt.) Using the Energy Policy Act (EPACT) of 1992, has a reduced water usage goal for the school been established? If yes, what is the annual goal?

____

____

____

☐ ☐ ☐ WE.2 (1 pt.) Have water efficient fixtures, including dual-flush water closets, low-flow shower heads; and automatic lavatory faucet shut off control; been considered? If yes, describe system:

____

____

____

☐ ☐ ☐ WE.3 (1 pt.) Is water efficient landscaping part of the site design? If yes, describe briefly:

____

____

____

☐ ☐ ☐ WE.4 (1 pt.) Is there either no irrigation system, or is irrigation used only for the athletic fields?

____

☐ ☐ ☐ WE.5 Have innovative rainwater collection (2 pts.) and/or wastewater/ gray water (2 pts.) treatment, and/or other reuse techniques (2 pts.) been incorporated? If yes, describe.

____

____

____

ENVIRONMENTALLY PREFERABLE MATERIALS AND PRODUCTS (PM) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ PM.1 (1 pt.) If there was an existing building on site, was a significant portion of the existing building and /or envelope preserved? Please describe briefly.

____

____

____

☐ ☐ ☐ PM.2 (1 pt.) Were any on site materials reused for the project, such as structural steel beams, crushed concrete serving as aggregate, land clearing waste, etc? Please describe briefly.

____

____

____

☐ ☐ ☐ PM.3 (1 pt.) Were locally available salvage materials used? Please describe briefly.

____

____

____

☐ ☐ ☐ PM.4 (1 pt.) What environmentally preferable materials and products have been used for the facility and where will they be used? What materials will have recycled content? Which materials will be highly durable and east to maintain?

____

____

☐ ☐ ☐ PM.5 (1 pt.) Is recycling "designed-in" as an integral part of the building to collect and store recyclable materials? How does the design facilitate recycling by students and staff?

____

____

☐ ☐ ☐ PM.6 (1 pt.) Were specifications developed to limit construction waste? Describe desired parameters and how they were executed.

____

____

____

RENEWABLE ENERGY SYSTEMS (RES) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ RES.1 (2 pts.) Are renewable energy strategies being utilized for the school? If yes, please briefly describe them.

____

____

____

☐ ☐ ☐ RES.2 (1 pt.) Were renewable energy strategies utilized in the Energy Analysis? If so, how much annual energy usage was saved?

____

____

____

☐ ☐ ☐ RES.3 (1 pt.) Have available renewable energy incentives been considered when evaluating various renewable energy technologies and systems? Submit specifics on energy incentives considered.

____

____

____

☐ ☐ ☐ RES.4 (1 pt.) Are there non-energy benefits associated with the proposed renewable energy systems; for example: peak shaving benefits, off-setting cost advantages (e.g. using photovoltaics as building materials; using the renewable system as a teaching tool; etc.)? If yes, describe them.

____

____

____

VISUAL COMFORT (VC) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ VC.1 (1 pt.) Do the daylighting and electric lighting system designs provide illumination as uniformly as possible, using task or accent lighting as appropriate to meet specific needs? If yes, what tools have been used to model the interactions of both these systems in terms of their impacts on visual comfort?

____

____

____

☐ ☐ ☐ VC.2 (1 pt.) What shading strategies (internal and external) have been selected for exterior windows?

____

____

____

☐ ☐ ☐ VC.3 (1 pt.) Have the color and texture of wall, floor, and ceiling surfaces been taken into account in terms of their interaction with the lighting and their combined impact on the visual environment? If so, please explain.

____

____

____

____

THERMAL COMFORT (TC) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ TC.1 (Prerequisite) Has the building been designed to be in compliance with ASHRAE Standard 55?

____

☐ ☐ ☐ TC.2 (1 pt.) Can room temperature for all instructional areas throughout the building be maintained individually?

____

☐ ☐ ☐ TC.3 (1 pt.) Have the outdoor ventilation systems been designed to limit the maximum building humidity level at 55% RH? If yes, describe how.

____

____

____

☐ ☐ ☐ TC.4 (1 pt.) Can individual space temperature and building humidity be trended? Please describe briefly.

____

____

☐ ☐ ☐ TC.5 (1 pt.) Is the building designed to set back room temperature during the unoccupied periods? If so, can individual room temperatures be over-ridden during unoccupied periods? If so, describe how.

____

____

____

☐ ☐ ☐ TC.6 (1 pt.) Have HVAC air distribution layouts been designed to ensure all parts of a room receive adequate ventilation? Please describe briefly.

____

____

____

ACOUSTIC COMFORT (AC) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ AC.1 (1 pt.) Are all classrooms located so there is no exposure to sources of outside noise (aircraft, highways, industrial sites)? If so, what measures are being used to reduce the impact of this noise?

____

____

____

☐ ☐ ☐ AC.2 (1 pt.) Are all classrooms located away from sources of inside noise (HVAC, band, and music rooms)? If so, what measures are proposed to reduce the impact of this noise? What is the STC rating of walls between classrooms and adjacent noisy spaces?

____

____

☐ ☐ ☐ AC.3 (1 pt.) Do the proposed materials and finishes, especially those used in the classrooms, contribute to reducing sound reverberation? What RC level have classrooms been designed to? Please describe briefly.

____

____

____

☐ ☐ ☐ AC.4 (1 pt.) Have the classrooms been designed to enhance projected acoustic performance? If so, how?

____

____

____

☐ ☐ ☐ AC.5 (1 pt.) Will the proposed heating/ventilating/air conditioning (HVAC) system for the classrooms create noise? If so, how will the impacts of this noise be dealt with?

____

____

____

☐ ☐ ☐ AC.6 (1 pt.) Has a sound enhancement been used in at least half the classrooms? If so, please describe briefly.

____

____

INDOOR AIR QUALITY (IAQ) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ IAQ.1 (1 pt.) Is the site located away from any sources of outdoor pollution? If so, what measures have been taken to minimize their impact?

____

____

____

☐ ☐ ☐ IAQ.2 (1 pt.) Does the basic layout of the school keep operable windows and air intake vents away from sources of exhaust?

____

☐ ☐ ☐ IAQ.3 (1pt.) Is the HVAC system designed to minimize conditions conducive to mold/microbial growth? Describe.

____

____

____

☐ ☐ ☐ IAQ.4 (1 pt.) Does the design include individual exhaust/ventilation strategies for areas that may be sources of pollution, such as: kitchens, restrooms, science labs, chemical storage closets, dedicated copy rooms, and vocational/industrial shop rooms? Please describe briefly.

____

____

____

☐ ☐ ☐ IAQ.5 (1 pt.) Does the design include CO2 monitors for spaces with large variable, occupant loads? Please describe briefly.

____

____

☐ ☐ ☐ IAQ.6 (2 pts.) Have interior materials and products been used that are low emitters of indoor air contaminants? Please describe briefly.

____

____

☐ ☐ ☐ IAQ.7 (2 pts.) Is there a plan to 'flush out' the facility for at least 72 hours after construction and before occupancy?

____

FLEXIBILITY AND ADAPTABILITY (FA) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ FA.1 (1 pt.)Do spaces facilitate short-term reconfigurations of the learning environment to suit different activities and programs? Are spaces being designed so they can accommodate numerous furniture layouts? Please describe briefly.

____

____

____

☐ ☐ ☐ FA.2 (1 pt.) Has the school been designed to accommodate potential future changes - for example, response to changes in grade structure, curriculum, community use, student population, etc.? Please describe briefly.

____

____

____

☐ ☐ ☐ FA.3 (1 pt.) Will the design allow the school to adapt to year-round and/or 24-7 hour operation? Please describe briefly.

____

____

____

☐ ☐ ☐ FA.4 (1 pt.) Are the lighting and IT systems configured to allow for maximum flexibility in room utilization, especially in the classrooms? Describe.

____

____

____

☐ ☐ ☐ FA.5 (1 pt.) Do the electrical, IT, telecom, and security systems have sufficient excess capacity to expand and change over time?

____

SAFETY AND SECURITY (SS) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ SS.1 (1 pt.) Have areas of the building been designated for use as a community emergency shelter? Please describe briefly.

____

____

____

☐ ☐ ☐ SS.2 (1 pt.) Have appropriate shelter spaces been designated? Please describe briefly.

____

____

____

☐ ☐ ☐ SS.3 (1 pt.) Has the site been studied to find where potential safety and security risks come from, i.e. high traffic corridors, environmental hazards or brown fields, etc? How have potential risks been addressed?

____

____

____

☐ ☐ ☐ SS.4 (1 pt.) Have access/egress points been reviewed on the basis of lockdown and evacuation? Please describe briefly.

____

____

____

☐ ☐ ☐ SS.5 (1 pt.)Have opportunities for natural surveillance and access control been 'designed in?' If so, please describe briefly.

____

____

____

ACCESSIBILITY (A) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ A.1 (1 pt.) Are measures being used to ensure the facility is friendly to physically and cognitively disabled students? Please describe briefly.

____

____

☐ ☐ ☐ A.2 (1 pt.) Do instruction spaces offer a variety of subspaces that are visually and acoustically distinct, and can instructional spaces accommodate a teacher plus other adults (special teachers, personal aides, etc.), if necessary? Please describe briefly.

____

____

☐ ☐ ☐ A.3 (1 pt.) Are key spaces accessible to all students without having to unnecessarily separate students with disabilities from the rest of the student body (i.e. cafeteria, auditorium, libraries, etc.) ? Are accessible areas integrated well into each space, i.e. accessible spaces and seating areas are not separated from the rest. Please describe briefly.

____

____

☐ ☐ ☐ A.4 (1 pt.) Have outdoor spaces been designed to accommodate the various needs of students with special needs? Please describe briefly.

____

____

☐ ☐ ☐ A.5 (1 pt.) Do furnishings, fixtures, and equipment (FF&E) accommodate students with physical and/or cognitive disabilities (e.g. tables with rounded edges and corners, height-adjustable desks, lockers at the end of locker rows, etc.)? Please describe briefly.

____

____

LEARNING CENTERED DESIGN (LCD) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ LCD.1 (1 pt.) Were consultations with teachers, administrators, staff, and students scheduled throughout the design of the building to insure the building and grounds support best instructional practices? Please list number and dates of consultations and the categories of people who attended, e.g. science teachers, classroom teachers, ad ministration, etc.

____

____

☐ ☐ ☐ LCD.2 (1 pt.) Does the space used for teaching and learning provide opportunities for both individualized and group instruction? Can furniture be reconfigured to accommodate work areas of different sizes and types? Please provide two examples of how this was done.

____

____

____

☐ ☐ ☐ LCD.3 (1 pt.) Do students and teachers have unique places to work and gather (desks, meeting areas, etc.) that provide a feeling of ownership and, therefore, stewardship of the building? For example, do teachers have places where they can meet to do group planning? Please describe briefly.

____

____

☐ ☐ ☐ LCD.4 (1 pt.) Is the facility treated as a "3-D Textbook" in that building systems are visibly and physically accessible ? Are sustainable features documented with signage or other graphics? Please document at least three examples of this 3-D Textbook design.

____

____

____

☐ ☐ ☐ LCD.5 (1 pt.) Are spaces designed for instruction to support inquiry-based learning? For example, do students have access to materials needed for experiments, including water, work space, cleaning supplies, and equipment storage? Are resources such as Internet access and reference books easily accessible? Please describe briefly.

____

____

INFORMATION TECHNOLOGY (IT) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ IT.1 (1 pt.) Do the locations of projection equipment, whiteboards, monitors, etc. work well with the lighting/daylighting and heating/cooling strategies? Please explain briefly.

____

____

☐ ☐ ☐ IT.2 (1 pt.) Have the information technology systems been accommodated and/or integrated with building systems? (for example, HVAC, electrical, fire alarm, security etc.) Please explain briefly.

____

____

☐ ☐ ☐ IT.3 (1 pt.) Have the information technology systems been accommodated and/or/ integrated such that building performance metrics are readily available to its occupants? Please explain briefly.

____

____

☐ ☐ ☐ IT.4 (1 pt.) Are specific strategies/procedures defined to train occupants on how to access building performance metrics? Please explain briefly.

____

____

☐ ☐ ☐ IT.5 (1 pt.) Were the plug loads and/or heating loads of technology and equipment considered in the thermal and energy analyses for the facility?

____

OUTDOOR LEARNING AREAS (OLA) – CRITERIA CHECKLIST

Yes No N/A

☐ ☐ ☐ OLA.1 (1 pt.) Is at least 5% of the school site devoted to the outdoor learning area? An ideal outdoor learning area is at least one half acre. Provide map of site.

____

☐ ☐ ☐ OLA.2 (1 pt.) The area devoted to outdoor learning should have topsoil (suitable for growing plants) at least five inches deep and a portion of the area devoted to outdoor learning should have direct sunlight at least six hours a day. Please provide a map of the site including the outdoor learning area.

____

☐ ☐ ☐ OLA.3 (1 pt.) The area devoted to outdoor learning should have access to a water source (e.g. hose, pond or cistern) that can be used for watering plants, cleaning tools, running experiments, etc. This source should be within fifty feet of the site. (Note: If using a natural water source, make sure it is tested regularly for safety.
Please describe your water access.

____

____

____

☐ ☐ ☐ OLA.4 (1 pt.) The area devoted to outdoor learning should be in a safe location away from traffic, construction excessive sun or other hazards. A quiet area is also helpful, where this is possible. Please describe.

____

____

____